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CONTENTS.

EDITORIALS 253
New President for Westinghouse Electric 256
Electrometallurgical Experimental Plant in Canada 256
Chicago Electric Vehicle Manufacturers' Association 256
S. E. Doane 257
Cedar Rapids Electrical Ordinance 257
Indiana Electric Light Association 257
Co-operation Between Central Stations and Manufacturers 258
Pennsylvania Terminal Completed 258
Hydroelectric Power as Applied to Irrigation.—II 259
The Copper Situation 263
OHIO ELECTRIC LIGHT ASSOCIATION 264
Single-Phase Motors 266
Introduction of Electric Vehicles 266
Methods of Obtaining New Business in Cities of 15,000 or Less 266
Experience with Series Tungsten Lamps for Street Lighting 267
Tungsten Lamps vs. Central-Station Earnings 267
Central-Station Facts and Factors 267
Securing Off-the-peak Load 268
Outline of an Equitable Power Rate 270
Electric Meter Accuracy 270
Best Methods to be Followed in the Purchase of Station Apparatus 270
Electric Club Picnic 272
Another Step towards Chicago Railways Merger 272
Convention of Association of Railway Engineers 272
Recent Improvements in Distributing Transformers and Their Relation to Methods of Distribution 273
Some English Power Rates 274
Hydroelectrics in Japan 275
Water Power in Bavaria 275
Minimum Service Charge for Electricity 275
New Hydroelectric Plant in Germany 275
Proposed Smoke-Abatement Ordinance 275
The Morgan Memorial Building at Hartford 276
Argentine Electrical Illumination 278
Ornamental Lighting for Omaha 278
To Equip Lightships with Wireless 279
The Automatic Enunciator 279
Army Wireless Outfits 279
Telephone Supplies Wanted in Mexico 279
The History of the Telephone 280
Test of Submarine Telephone Cable with Pupin Coils 282
The Telephone in Life-Saving Service 282
More Telephones for Santa Fe Road 282
Argentina-Europe Cable Opened 282
Bell Telephone Managers Confer 282
An Electrically Operated Coal Mine 283
More Railroad Electrification in Switzerland 284
Steam-Driven Mines to Electrify 284
Power Plant for Arizona Mine 284
Electrical Developments in the Southwest 284
Power for Mining 284
Electrically-Driven Jute Plants 285
Hydroelectric Power for Mexican Mines 285
Electrically Operated Fuel Plant 285
FINANCIAL REPORTS OF ELECTRICAL COMPANIES 285
Electrical Exports for June 285
NEW ELECTRICAL AND MECHANICAL APPARATUS AND APPLIANCES 286
CURRENT ELECTRICAL NEWS 291
RECORD OF ELECTRICAL PATENTS 298

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DO WE ADVERTISE ENOUGH?

The United States has long been known as the pioneer in advertising and as the leading country in projecting and managing "World's Fairs," and yet the news comes from abroad that the American exhibit at the Brussels Exposition is absolutely insignificant as compared with those of the European countries.

Mr. Slason Thompson, in a letter to the editor of the Chicago *Record-Herald*, says in part: "When we asked to be directed to the American exhibit, officials, barkers and exhibitors either shook their heads or stared at us in pitying wonder. After having been sent on half-a-dozen wild-goose chases into opposite wings of the grounds, we finally got hold of a map of the buildings, and there, sandwiched in between Japan and Switzerland, we found the red and white stripes which served as the guiding stars to our weary footsteps. And what do you guess we found as the reward for all our patriotic pains? An exhibit worthy of the greatest republic on the face of the globe, in the one hundred and twenty-first year of its remarkable prosperity? Not by the strongest expression you can think of. So far as we could perceive, the entire exhibit of the United States consisted of typewriters (machines, not operators), sewing machines, candy-working machines and two $435 autos. Only these and nothing more! Secretary Knox ought to be ashamed of permitting the exposition to go by with such a paltry and humiliating showing on our part. There is not a state in the Union that should not have had a better exhibit than that made for the United States. No description can do justice to its insignificance, and all talk of promoting our export trade in the face of the invidious comparison inevitable from its contemplation is paltering with a momentous opportunity."

A glance over recent issues of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN will show that this is probably a record year for expositions in foreign lands, and that there are great opportunities for American representation in these international shows, especially in South America, where our sister republics are holding, or will hold in the near future, centennial anniversaries of their respective independencies. Cannot our Government at Washington spare a little time from its interference in foreign affairs, which is making the United States extremely unpopular—to say the least of it—in certain quarters, to promote our growing foreign trade in

an effort to keep up with foreign expansion? The British and Germans, our greatest competitors, are doing this, and their foreign trade is increasing in due proportion. Why cannot we do something in this line, and be a leader where at present we are hardly a follower?

The manufacturers and exporters are also to blame for their lack of initiative in this matter. Perhaps much of this is due to their not being informed in due time of the date, extent and importance of impending expositions. If this is so, then there seems to be room for some co-operative action, such as the appointment of a committee or representative of the principal manufacturers and exporters, with the object of acquiring definite and timely information of future foreign expositions. Failing this, some arrangement might possibly be made with the Bureau of Manufactures, Washington, D. C. Thus the Bureau, which receives regular reports of these matters from our consular officials abroad, might make up a mailing list of the principal manufacturers or exporters, or of the chambers of commerce, and notify these in due course of proposed expositions abroad.

THE WIRELESS AS A POLICE HELP.

Notorious because of its worldwide publicity, theatrical in its development, the sordid tragedy of "Belle Elmore," the former London music-hall favorite, has excelled the wonderful detective stories of Conan Doyle and Gaboriau by the intervention of that modern Sherlock Holmes, the wireless telegraph.

The alleged murder was itself prosaic enough. Dr. Hawley Harvey Crippen, an American dentist, is charged with murdering his wife, the vaudeville artiste mentioned above, in a London house. The details do not matter here. He slipped away from the Scotland Yard detectives, and, with his alleged accomplice and former amanuensis, Miss Ethel Clare Leneve, went to Antwerp, and finally embarked for Canada on the liner *Montrose*. Meanwhile, by wire and cable, the police of two continents were called in to aid in the search for the fugitives. It was supposed that the suspects might have sailed for America, and all outgoing ships from European ports were closely watched, and a wireless net was drawn around the liners at sea which were equipped with radiotelegraphic apparatus.

Word was flashed from the *Montrose* that the suspects were probably aboard that vessel. A Scotland Yard detective followed the *Montrose* on a faster ship, and arrived in Canada ahead of the other boat, meanwhile keeping in wireless communication with the slower vessel during the greater part of the trip. With the arrival of the *Montrose* at Father Point, Canada, on July 31 last, the English detective boarded the ship with the pilot and apprehended the fugitives.

Thus did the wireless accomplish its first recorded feat as a detective agent from land to a ship in midocean. With the perfection of wireless telephotography, now almost past the experimental stage, a fugitive from justice will be less safe on a ship than on land where his possibilities of escape from observation and apprehension are, of course, much greater.

The electric light on land has caused crime to be much less frequent. The telegraph and telephone have rendered invaluable aid to the police on innumerable occasions. And now the wireless telegraph has established itself in a way in which probably no other agent would be of service. Electricity is not only binding this world closer together and making it a better place in which to live, but it is also rendering it as safe as was England under the rigid laws of the old Saxon king, when, according to the ancient chronicler, a man could walk from one end of the kingdom to the other with a bosomful of gold without fear of molestation.

THE OHIO ELECTRIC LIGHT ASSOCIATION.

The sixteenth annual convention of the Ohio Electric Light Association was held on Tuesday, Wednesday and Thursday, July 26, 27 and 28, at the Breakers Hotel, Cedar Point, Ohio.

This association is one of the most representative state associations in the electrical fraternity. At the convention just closed there was a fine representation of central-station men and an enthusiastic attendance of manufacturers' representatives. The appointments were complete, and a thoroughly enjoyable holiday session was the reward of those who attended this convention. While the weather during the sessions was extremely hot, a comprehensive list of papers was disposed of and, although the discussion was not far-reaching and, in fact, rather desultory in character, it is believed that a great deal of good was accomplished.

It is unfortunate that the paper by Mr. Booth on "The Tungsten Lamp vs. Central-Station Earnings," and the paper by Mr. Gardiner on "An Outline of an Equitable Power Rate" did not receive more attention from those present. Central-station men seemed to dodge this issue. Of course, they know their business better than we do, and it may be good policy to believe that so long as new customers can be added to the lines to take up the energy released through the introduction of more efficient consuming devices, or so long as customers can be persuaded to use more energy without increasing their bills, a change in methods is unnecessary. On the other hand, there are central-station managers who believe that it is possible for a saturation point to be reached and that the production of a lamp operating on a fraction of a watt will spell financial distress under the system of charging for current on a straight meter basis.

Under the leadership of some of the more enterprising ones, however, this subject is being given thought and study, and without doubt there will be elucidated some practical system of charging which will eliminate any

necessity for further change, no matter how efficient may become the current-consuming apparatus.

In connection with the general spirit of wholesomeness and cordiality which made this convention a most happy occasion, too much credit cannot be given to the Committee on Arrangements, and to that generous and indefatigable spirit, D. L. Gaskill, secretary of the association. Whenever the comfort of the visitors was in question or the perfecting of detail in connection with any of the numerous functions attendant upon the conduct of the convention was involved, Mr. Gaskill was ever ready with a pleasant word and a ready solution. The association is also to be congratulated upon the large attendance and fine representation of ladies during the entire session.

THE TELEPHONE IN ENGLAND AND AMERICA.

The account of the telephone in England, as related by Mr. Casson in this issue, does not put telephone development in that country in a very favorable light as compared with its condition in America. Another point of view in the comparison is furnished by the report of Major W. A. J. O'Meara, Engineer-in-Chief of the British Post Office, who made a tour of inspection in this country last year, and has recorded his impressions in the *Post Office Electrical Engineers' Journal*.

The difference between the administration of a British public department and an American corporation is large and impressive, but Major O'Meara was particularly struck with the broad-mindedness of the American officials, with the organization and relation of the commercial, constructing and operating departments, with the close relation between the operating companies and the manufacturers, and with the responsibility which is placed upon the subordinates.

This question of pushing responsibility down the line is one which may well be taken to heart by every superintendent. If there are always certain things regarding which every man must exercise his judgment, and take the responsibility for that judgment, a spirit of enthusiasm and loyalty is aroused which will produce results of a superior order. As Major O'Meara truly says: "The cost of the mistakes which may be made from time to time is paid for many times over by the greatly increased output of work of every official. Such an arrangement also has the merit of developing the most useful attributes of man, and hence there is no lack of the proper material for filling the highest administrative posts."

GETTING AN INTRODUCTION.

In ordinary business transactions the obtaining of a proper introduction to the right party is often the means of achieving a successful result, and so it is with electricity. Many thousands of customers have been introduced to the benefits of electricity for other than lighting purposes by the simple means of putting out electric flatirons on the one-month's-trial system, selling electric toasters on the easy-payment plan, etc., and many more householders will yet be converted by the same or similar means.

When a prospective customer can be persuaded to make a free trial of electricity for heating or power purposes, every endeavor should be put forth to get him interested in this way.

There is a tremendous field open for the use of electricity in building and contracting, and a little liberality by the central stations will soon be rewarded by the "conversion" of even the most conservative of builders. One of the best devices to use as the entering wedge is the electric soldering iron. Its cost is inconsiderable, it uses but a small amount of current, and its advantages over the ordinary iron are legion. There are plenty of housewives using the electric flatiron today who "would not be without it for $500," and the same applies to the workman who once tries the electric soldering iron. Many of the ladies who obtained their first introduction to electric heating through the electric iron are now using electric percolators, toasters, washing machines, and other labor-saving utilitarian household appliances, and the builder who adopts the electric soldering iron will soon be making inquiries about other electrical aids to his profession.

THE ELECTRIFICATION OF MINES.

It is a common saying in some parts of the Rockies and perhaps in other mining districts that a considerably larger amount of money has been put into mining development than has ever been taken out of the mines. The ore is in the mines, but the cost of getting it out and refining it often exceeds the value of the pure metal. It is in such cases as this that electric power generated by a large central station is of particular value.

Mr. O. B. Willcox, vice-president of the Central Colorado Power Company, speaking on this subject before the Electric Club of Denver, laid particular stress on the economy of electric power in mining. Speaking definitely of the cost of power he made the statement that a number of mining companies now supplied with electric power had reported a saving of from twenty-five to fifty per cent of their former power expenditures.

This statement may at first sight seem a little exaggerated and it may be that every instance would not show such a marked saving. Still it opens up a way to put many of the mines on a paying basis. Some of the mining properties could operate at a profit if it were possible to make a saving of even ten per cent over the old operating cost. In the greater part of our mining districts there are a number of mine shafts within a comparatively small radius. In many parts of the Rocky Mountains the slopes are scattered with both working and deserted mines and some of the latter have struggled on for a time and then failed to pay only by a small margin.

NEW PRESIDENT FOR WESTINGHOUSE ELECTRIC.

EDWIN F. ATKINS, OF BOSTON, ELECTED TO SUCCEED GEORGE WESTINGHOUSE.

At a meeting of the board of directors of the Westinghouse Electric and Manufacturing Company for organization the following officers were elected:

Chairman, Robert Mather.

President, Edwin F. Atkins.

First Vice-President, E. M. Herr.

Second Vice-President, L. A. Osborne.

Third Vice-President and Attorney, Charles A. Terry.

Acting Vice-Presidents, G. W. Hebard and H. D. Shute.

Secretary, W. A. Esselstyn.

Treasurer and Assistant Secretary, T. W. Siemon.

Auditor and Comptroller, James C. Bennett.

Assistant Auditors, F. E. Craig and W. B. Covil, Jr.

Edwin F. Atkins, who was elected president to succeed George Westinghouse, is of the firm of E. Atkins & Company, Boston, and has been, since the reorganization of the company, a member of the board of directors of the Westinghouse Company. Mr. Atkins, at the urgent request of the board, accepted the election to the presidency with the understanding that his retention of the position is to be temporary and only until the board shall select a permanent successor.

The change in the presidency of the company was not unexpected. It has been known that there was some friction between Mr. Westinghouse as president and Mr. Mather as chairman of the board, over the financial policies of the company. Mr. Westinghouse remains a member of the board, his term expiring in 1912. He is the largest single owner of the company.

Mr. Atkins, the newly elected president, is a director in the American Sugar Refining Company and is president of the Aetna Mills.

At the meeting of the board all the other officers were re-elected, the meeting being held at 165 Broadway, New York. Ten directors attended this meeting, Mr. Westinghouse not being present.

It is believed that E. M. Herr, the first vice-president is ultimately to be chosen as president of the company. Mr. Herr has been practically in charge of operations for some time, owing to the extended vacation granted Mr. Westinghouse some months ago, and has been mentioned frequently of late as the immediate successor of Mr. Westinghouse.

Mr. Atkins' election does not mean any material change in the administrative or financial policy of the company. The company is now making a record output. The report for the year ended March 31 last showed earnings of approximately 7.45 per cent on the assenting stock.

For the month of July so far the shipments by cars sent out are more than 10 per cent greater than in June. Some large orders have been received recently, and the outlook for business is said to be very good.

Mr. Mather, chairman of the board, was asked about the renewed rumors of a closer affiliation of the Westinghouse and General Electric interests, and said. "You can say it as coming from me that talk of affiliation with the General Electric Company is silly, and always has been."

Among recent improvements, it is announced that a tract of land, comprising seventy acres, adjoining the property owned by the Westinghouse Machine Company has been bought at Trafford City by the Westinghouse Electric and Manufacturing Company, for the purpose of erecting a large foundry. The purchase of the ground involves an expenditure, it is said, of about $250,000, and the foundry will be one of the largest of its kind in the world, and 2,500 men will be employed.

When the plant is completed the Cleveland foundry, belonging to the same company, and the one on the north side of Pittsburg, will be centralized at the new location, and thus place all of the foundries of the Westinghouse interests in one town, making great economies possible and reducing the cost of shipment of castings to a minimum.

Electrometallurgical Experimental Plant in Canada.

A recent dispatch from Phoenix, B. C., states that an electrical lead-zinc experimental plant has been erected at Cranbrook and that some tests on local ore will be made.

Chicago Electric Vehicle Manufacturers' Association.

To promote the sale of electric vehicles and to instruct owners how to properly care for them after they have been sold are the objects of the Electric Vehicle Manufacturers' Association which has recently been formed in Chicago, composed of manufacturers and dealers in electric automobiles and storage battery men.

The association, realizing the serious drawback encountered by the electric vehicle industry through neglect and misuse of batteries, will bend its efforts to instruct owners and garage keepers in this particular. Its aim will be to undertake the work in a systematic manner, and it expects to open a downtown office and employ a manager to look after the affairs of the organization.

At the last meeting of the association, held Thursday, July 21, at the Lexington Hotel, it was decided to postpone any definite action until the fall meeting, which will be held the first week in September.

The association has elected the following officers: L. E. Burr, Woods Motor Vehicle Company, president; Ralph Temple, Baker Motor Vehicle Company, vice-president; Godfrey H. Atkin, Electric Storage Battery Company, secretary; J. C. Cooley, Waverley Company, treasurer. The board of managers is composed of the president and secretary of the association and the following directors: E. Louis Kuhns, Studebaker Automobile Company; F. A. B. Smith, Rauch & Lang Carriage Company; John T. Fisher, Babcock Electric Carriage Company; F. E. Price, Anderson Carriage Company, and D. W. O'Brien, Columbus Buggy Company.

Dry Weather Interferes With Power Plants.

Recent dry weather has dried up the Mississippi River to such an extent that power development at the hydroelectric plants is interfered with to a considerable extent. At Minneapolis, Minn., it is reported that the river is so very low that flour mills are for the greater part using steam power. The Twin City Rapid Transit Company of that city has arranged with the General Electric Company for use of Minneapolis generated power, and the General Electric Company will utilize steam power.

S. E. Doane.

It is with genuine pleasure that the historian whittles his pen and begins upon a chronicle of the events which have attended the career of this most charming man of science and of commercial activity, Samuel Everett Doane. It is a peculiar coincidence that has made Mr. Doane and his work synonymous. The expression "high efficiency" is applied with equal aptness to the man or to the product of his talent.

Samuel Everett Doane was born at Swampscott, Mass., on February 28, 1870. He was graduated from the Swampscott High School in June, 1886, and was associated with the Thompson-Houston Company at Lynn, Mass., from 1886 to 1892. He studied under tutors, and worked on the testing force or in the laboratory four nights each week for six years, and rose from office boy to acting engineer and assistant foreman of the incandescent lamp department. When the lamp department at Lynn was shut down in 1892 because of the panic, all of the employes were released with the exception of Mr. Doane, who was transferred to Harrison, N. J. He served with the General Electric Company from 1892 to 1897, as assistant engineer of the Harrison Lamp Works in 1892 and 1893, superintendent of the Harrison Lamp Works in 1893 and 1894, acting engineer of the foreign department at Schenectady later on, and from 1897 to 1900 was superintendent of the Bryan-Marsh Company at Marlboro, Mass.

S. E. DOANE,
Chief Engineer of the Engineering Department, National Electric Lamp Association.

Upon the formation of the National Electric Lamp Association in 1900, Mr. Doane was made chief engineer of the engineering department, which post he has since retained.

Mr. Doane was married on October 17, 1900, to Miss Marion M. Jackman, and there are two children—Dorothy Helen, born on May 20, 1902, and Edward Everett, born on February 12, 1905.

Mr. Doane is a member of the American Institute of Electrical Engineers, the American Association for the Advancement of Science, the Illuminating Engineering Society, the Franklin Institute, the National Electric Light Association, Canadian Electrical Association, Association of Car Lighting Engineers, Ohio Electric Light Association, Ohio Society of Mechanical, Electrical and Steam Engineers, the Rejuvenated Sons of Jove, and the Electrical League of Cleveland.

Mr. Doane represents one of the most interesting embodiments of a mind adapted to the development of high ideals, both in social intercourse and in commercial applications, and a body physically fit to carry on the active enterprise of the mind behind it. He is considered to be the most expert lamp manufacturer in the country today, and his prominence has been achieved through hard work and patient endeavor.

Within recent years he has been actively associated with the movement to bring about an equitable and reasonable system of charging for central-station current, and while as a manufacturer he has been handicapped to a considerable extent in the educational effort in which he has been engaged, so sincere has been his attitude and so definite and logical the expression of his motives, that he has been recognized as a leader in this direction, and his ideas accepted in all sincerity by the central-station industry.

S. E. Doane is not only a man of science, a big man physically and an enterprising commercial genius, but he is a personality of peculiar rareness. He is a likable man among a very likable coterie, and though there may be many men who are esteemed as highly, when Doane is around he holds the center of the stage, the admired of all admirers.

Cedar Rapids Electrical Ordinance.

A new electrical ordinance has been passed by the Cedar Rapids (Iowa) City Council, which includes the following provisions:

Approved metallic conduits shall be used for inclosing all concealed electric-light or power wiring in new buildings, the rewiring of old buildings and in new installations in old buildings or additions thereto located within the district known as the fire limits.

All wiring for electric light or power hereafter installed in churches, theaters and other places used for public gatherings in the city of Cedar Rapids shall be installed in suitable approved metallic conduits, and all such wires thereafter installed in unfinished basements in old buildings other than dwellings designed for the occupancy of not more than three families, shall be likewise placed in similar conduits.

Indiana Electric Light Association.

The second annual meeting of the Indiana Electric Light Association will be held at the Denison Hotel, Indianapolis, Ind., August 17 and 18. An exceedingly interesting programme has been arranged, and the meeting promises to be well attended.

One of the features of the first day will be an automobile trip.

CO-OPERATION BETWEEN CENTRAL STATIONS AND MANUFACTURERS.

DISCUSSED AT ELECTRIC CLUB OF CHICAGO.

In furtherance of the plan inaugurated early in the summer, the meeting of the Electric Club of Chicago, held on Wednesday, July 27, was devoted to an informal discussion. The subject on this occasion was "Co-operation Between the Central Station and Manufacturers of Electrical Appliances," and its importance was evidenced by the earnestness of the discussion.

Homer Niesz, president, Cosmopolitan Electric Company, Chicago, was first to speak. He called attention to the enormous demand made upon the manufacturer by the central station for machines and apparatus. Starting with the generating station he pointed out that the heaviest expenses of a central station is its fixed cost for equipment, supplies, etc., and the manufacturer derives the benefit from this investment. Likewise, the tansmission system, substations, distributing system and customers' premises were considered, Mr. Niesz illustrating the extent to which the manufacturer receives business from the central station. As to his opinion regarding the extent with which the manufacturer can co-operate with the central station, Mr. Niesz said that the electric show, held annually, offers excellent opportunities for both to come in close touch with each other and work together for the good of the industry.

E. L. Callahan of H. M. Byllesby & Company, Chicago, spoke of the merchandising of electrical appliances and apparatus. He said that salesmen could materially assist central stations by spending more time with them and actually showing the central-station solicitor how to market the various apparatus and appliances. He compared this method with one wherein the salesman induces the central-station manager to purchase a bill of goods and then leaves him to dispose of them as best he can. Speaking of new business departments of central stations, Mr. Callahan endorsed the methods now being employed by progressive companies.

S. F. Dibble, of the General Electric Company, Chicago, spoke of central stations maintaining selling prices of electrical apparatus. He said that central stations are bound to incur the ill will and consequently the more or less open opposition of the local dealers if they follow the practice of selling appliances below cost. The sale of a motor or other apparatus at less than the established price is, according to Mr. Dibble, a confession of weakness on the part of a sales organization. He said that the central station naturally and logically occupies the dominant position in the sale of current-consuming devices as well as in the sale of current, for the public will accept the word of the central-station man as to the merits of a piece of apparatus in preference to that of the dealer, and with this great advantage Mr. Dibble maintained that it is not only unnecessary, but distinctly ill-advised, for a central station to demoralize prices, thereby antagonizing the dealer directly and the public indirectly.

Speaking from the manufacturers' standpoint, Mr. Dibble said that it should be obvious to the central-station man that his interests and those of the manufacturer are identical. The manufacturer is producing the best goods he can and is supplying it at a price which represents only a fair profit; he is furthermore actively assisting the central station in the sale of apparatus by supplying attractive advertising matter and the personal assistance of trained specialists. The central station is co-operating by maintaining new business departments, carrying stocks of appliances, etc., etc. Mr. Dibble said that this co-operation is vital to the success of both and it should be augmented wherever possible. He said that in no way can this be done as effectively as by the maintenance of proper prices by the central station.

Ralph Kilner, of the Westinghouse Electric and Manufacturing Company, spoke briefly of the value of the advertising matter sent to the central stations by the manufacturers. He said that in preparing advertising matter central stations should confer with the manufacturers, who are always more than willing to supply intelligent and up-to-date matter.

William T. Dean, of the General Electric Company, Chicago, said that co-operation was the keynote of the policy of the General Electric Company. He said this is evidenced by the number of specialists and experts in every line, retained by the company to assist central stations.

J. Scribner, of the General Electric Company, Chicago, in demonstrating the great value of co-operation between central stations and manufacturers of electrical appliances, said that if a central station cannot dispose of its stock the manufacturer cannot dispose of his output; therefore, for both to be successful there must be co-operation.

C. A. S. Howlett, former president of the club, endorsed the points brought out by the previous speakers. He then spoke of an engineering building for Chicago, suggesting that with the co-operation of other societies and organizations in the city, the Chicago Electric Club could erect a building second to none in the country. He recommended that action be taken in the fall regarding this matter.

R. F. Schuchardt spoke briefly of the value of missionary work in the electrical industry. He said that both the central station and manufacturer should work towards a common end—that of popularizing electricity.

B. G. Jamieson, of the Commonwealth Edison Company, Chicago, spoke of the value of a commercial training for central-station employes. He said that it places them in a position to advise the manufacturer as to the wants and requirements of the trade and thus benefit both.

The discussion was closed by Glenn Marsden, who called attention to the electrical contractor, pointing out that there should also be a harmonious feeling between the central station and the contractor.

Pennsylvania Terminal Completed.

The unveiling of a statue of the late president of the Pennsylvania Railroad, A. J. Cassatt, in the new terminal station in New York City on August 1, marked the completion of the tunnel and terminal project.

President McCrea, with the directors and other officials of the road, traveled from Philadelphia in two special cars, and after running through the tunnel held a reception in the station. C. De Witt Cuyler, on behalf of the directors, presented the bronze statue to the railroad, and it was accepted by Mr. McCrea. The vast enterprise was the conception of Mr. Cassatt, and it was due to his initiative that the project was started. The terminal station will be thrown open to the public in a few weeks.

Hydroelectric Power as Applied to Irrigation.[1]—II.

Including an Illustrated Description of the System and Work of the Mt. Whitney Power Company.

BY JOHN COFFEE HAYS.[2]

Fig. 12 shows the load curve for the maximum demand during the years 1907, 1908 and 1909. It will be noted that the maximum demand at the power stations is very much less than the connected load, regardless of transmission losses, although the pumping load is considered extremely steady during the irrigation period, the pumping plants operating twenty-four hours per day at as near the full capacity of the motor as possible. The lighting load has no appreciable effect on the generating stations during the time of maximum demand, as it is balanced by a certain amount of power used only during the daylight hours.

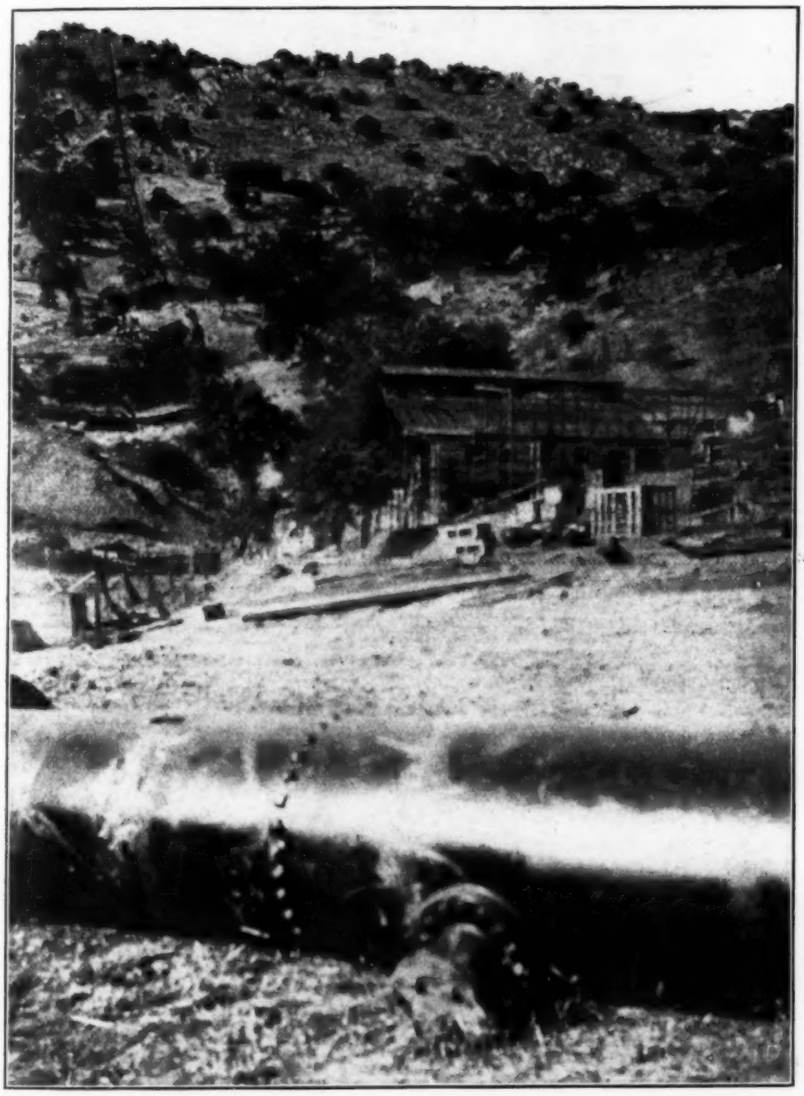


FIG. 11.—TULE RIVER POWER HOUSE AND PIPE TRENCH DURING CONSTRUCTION.

Fig. 13 shows the load factor of the system, and this also clearly points out an important condition to be considered in an enterprise of this character, as it is comparatively low. This curve shows that a large amount of power is available for market during the winter and spring months, and with such market obtainable, the capacity of the generating stations could be greatly increased, as the flow of the rivers is greatest at this time.

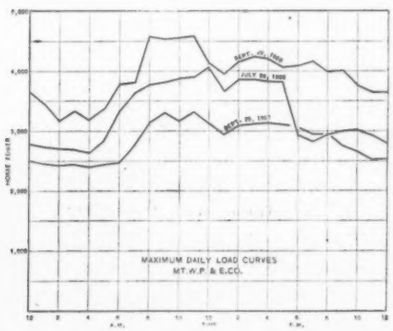


FIG. 12.—MAXIMUM LOAD CURVES.

Fig. 14 shows the characteristic flow of the streams during a very dry season, and is a combined curve of the Tule and Kaweah rivers. All of the rivers flowing into the San Joaquin valley have the same general characteristics, and a comparison of the load curve and this curve of stream flow shows the time of heavy load during the period of low water, and the generating plant must, therefore, be designed for the minimum flow of the stream unless suitable storage reser-

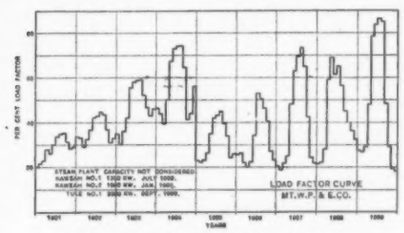


FIG. 13.—LOAD-FACTOR CURVE.

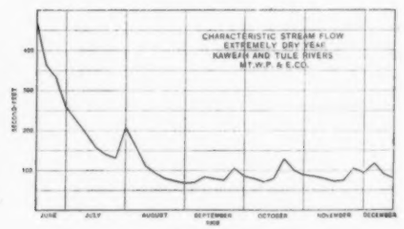


FIG. 14.—STEAM-FLOW CHART.

1 Abstract of a paper presented at the Pacific Coast meeting of the American Institute of Electrical Engineers, May 6, 1910. The photographs are reproduced by the courtesy of the author.

2 President of the Mt. Whitney Power Company.

voirs are available. These reservoir sites are available on some of the streams feeding the valley, but are scarce and expensive to develop, and the plants are designed for the minimum flow.

In connection with the load-factor curve, it is to be noted that when the load factor reaches approximately fifty per cent it is necessary to construct an additional plant.

GENERATING STATIONS.

The generating stations consist at the present time of three hydroelectric power plants having an aggregate capacity of 4,850 kilowatts, and one turbo-generator steam auxiliary plant having a capacity of 1,000 kilowatts. Two of the waterpower plants are on the Kaweah River and one on the Tule River, the steam auxiliary being in Visalia, the principal town on the system. The fourth waterpower plant, which will have a capacity of 3,000 kilowatts, will also be on the Kaweah River.

Power house No. 1 was the first constructed, and diverts the waters of the east fork of the Kaweah River through six miles of redwood flume. The plant was constructed in 1899, and the flume is today perfectly sound and will last at least ten years longer before it will require replacement. The static head obtained is 1,310 feet and the generators are driven by overhung wheels on the generator shaft. The equipment consists of three units of 450 kilowatts each, two belt-driven exciters, and four 500-kilowatt transformers, one being a spare transformer. The transformers are oil-insulated and were designed to be self-cooled, but additional cooling is obtained by pumping the oil through coils on which water is sprayed. The transformers are located in individual compartments entirely separate from the power house, as are also the lightning arresters and high-tension switches.

Regulation is manual, controlling stands being situated in front of the switchboard, two of which operate deflectors which regulate the amount of water applied to the wheels by deflecting the stream, and one of which regulates the water supply to the third machine by a needle nozzle. At the penstock a regulating reservoir in the form of a large flume has been constructed, having a capacity of 25,000 cubic feet. The main function of this reservoir is to smooth out the daily variation of stream flow, as, due to the method of regulation at the power house, no great economy of water can be practiced, although the needle nozzle allows the regulation of water to some extent. Since the other plants have been constructed, however, no regulation is done at No. 1, which simply takes a certain load and holds it.

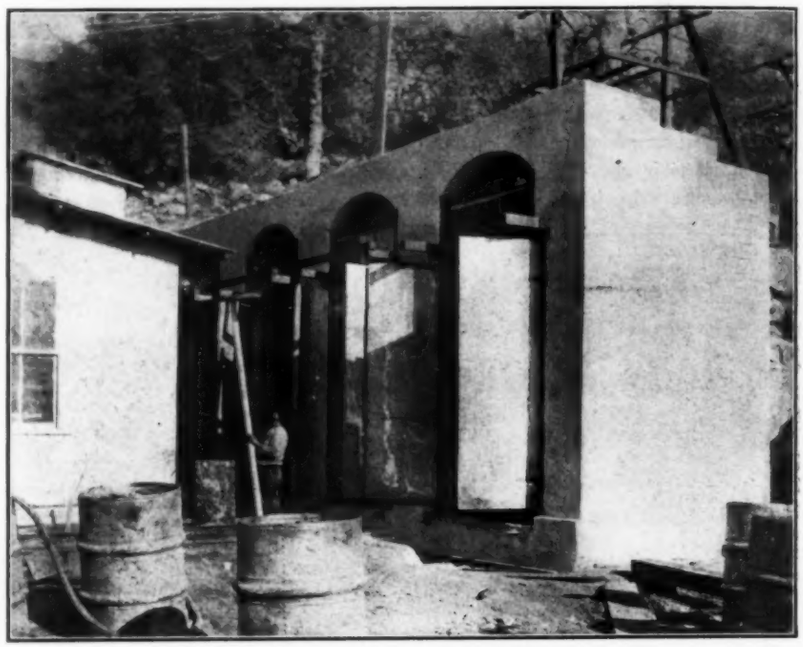


FIG. 15.—TRANSFORMER COMPARTMENT, POWER HOUSE NO. 2.

Plant No. 2 was constructed during 1904 and put into operation in January, 1905. The water for this plant is diverted from the main Kaweah river, and is conducted to the penstock through fifteen flumes aggregating 0.87 mile, and 3.1 miles of ditch. The flumes are all redwood and the ditch is concrete-lined, the ditch construction being used where the slopes will permit, the flumes being constructed on the rough broken ground and to cross ravines. A concrete-lined penstock reservoir is excavated in the side of the hill having a capacity of 75,000 cubic feet. The static head is 360 feet and the powerhouse equipment consists of three units of 500 kilowatts capacity, each

FIG. 16.—"PIONEERING SUBSTATION," TO BE REPLACED LATER BY PERMANENT BUILDING WHEN LOAD WARRANTS CHANGE.

direct-connected to high-head turbines regulated by Lombard governors. Two turbine-driven exciters are installed, which are hand-regulated. Seven 350-kilowatt step-up transformers are installed in compartments outside of the power house, one being in reserve. The transformers are cooled in the same manner as those at No. 1 by circulating the oil.

FIG. 17.—NO. 2 DITCH AND FLUME.

FIG. 18.—PORTERVILLE SUBSTATION.

The No. 3 Kaweah plant, on which construction is just started, will divert water from the main Kaweah river, which, after passing through a conduit ten miles long, will discharge just above the intake of No. 2, thereby using the water twice. The static head of this plant will be 1,960 feet.

The transformers at Nos. 1 and 2 are arranged on trucks so that they may be easily run into the power house under the crane for repairs, etc., if necessary. In No. 1, individual tracks are run from each transformer, and in No. 2, a transfer truck is run on the track in front of the transformer compartments, so a transformer may be pushed out on to the transfer truck and taken to a short piece of track entering the power house. The switching gear in both stations is arranged so that the spare transformer may be immediately cut in in place of any other transformer.

The buildings at both Nos. 1 and 2 are constructed of corrugated iron on wood frame, the foundations, floors and transformer compartments being constructed of concrete. The corrugated iron structure is, for all practical purposes, ample, as the climatic conditions are most favorable, and a protection from rain is about the only requirement necessary. These buildings are, however, cold in winter and hot in summer, and would not be considered strictly permanent or fireproof.

The third, or Tule River plant, was constructed in 1908 and 1909, and started operation in September, 1909. The water is diverted just above the junction of two forks of the river, there being two diverting dams and headworks from which short flumes lead to a point at approximately the junction of the river, and join. The water is conducted to the penstock through 4.5 miles of pine flume, 2.06 miles of concrete-lined ditch and 880 feet of inverted siphon pipe, the siphon working under a five-foot head and having its lowest point 120 feet below the conduit grade. This siphon was used to cross a long gulch.

The ditch is lined with concrete and excavated well into the mountain, very little reliance being placed on the filled bank, the water level being only six inches above the natural level of the downhill slope. The ditch is four and one-half feet wide and three feet deep, the sides sloping 1 to 1. It is lined with concrete two and one-half inches thick, over which one-half inch of cement plaster is applied. A small amount of alum was mixed with both the concrete and the plaster, which renders the lining practically watertight. Due to the steep slope of the mountain side and the size and depth of the ditch, the sloping of the upper bank to a slope of 1 to 1 required considerable excavation. However, the finished product is a most permanent piece of construction. The flume is of the standard bent-and-stringer construction, the bents being placed sixteen feet apart, and a strip of burlap saturated with an asphaltum compound is placed under the battens for waterproofing.

At the penstock a regulating reservoir

is excavated in the side of the mountain. A small portion of the upper end is five feet deeper than the balance of the reservoir and is used as a sandtrap. The reservoir is twelve feet deep, 350 feet long and of an irregular shape, varying from twelve to 125 feet in width, following the contour of the hill. The side slope is one-half to one, and it is lined with eight inches of concrete and one-half inch of plaster. A concrete wall at the end separates it from the penstock.

The reservoir has a capacity of 175,000 cubic feet, which will operate the plant one and three-fourths hours at normal load. Therefore, in the case of a break in the flume, sufficient time will be available to start the steam auxiliary plant without interruption of service. The reservoir also has sufficient capacity to regulate the daily fluctuation of stream flow during the low water period, so that the highest use may be made of the water. The static head is 1,135 feet, and the whole plant is designed with a view of ultimately doubling the present capacity.

The powerhouse equipment consists of two 1,000-kilowatt units with overhung wheels, Lombard governors, directly actuating needle nozzles, an auxiliary nozzle being provided, which automatically opens in the event of the main needle nozzle closing too quickly and ramming the pressure pipe. These auxiliary nozzles, when opened, close at a predetermined speed regulated by the dashpot principle. This arrangement allows the most economical use of the water. Two exciters, each of sufficient capacity for both generators are installed, one being driven by a waterwheel and one by an induction motor. Seven 400-kilowatt water-cooled transformers are placed in the transformer room on one side of the power house, one transformer being held in reserve. Lightning arresters and high-tension switches are in a separate building.

The powerhouse building and arrangement differ from the other plants in several respects. The power house is constructed of ferroinclave on a steel frame, the ferroinclave being plastered on each side with one and one-half inches of cement plaster, therefore making a reinforced concrete roof and sides three inches thick. A partition of the same thickness divides the generating room from the transformer room and a similar partition divides the transformer room into two compartments, fireproof doors completing the separation. The switch house is constructed of the same material, and both buildings have metal window-casings and wired-glass windows, no wood being used in the construction. The above may seem inconsistent after the statement that the other powerhouse structures were practically sufficient, and this would be the case, were it not for the fact that the transformers which present a certain fire hazard are placed in the powerhouse building. Also the company has passed the pioneer period, and can, consequently, afford a little more permanent construction.

The switching gear and wiring has been greatly simplified by connecting the transformers in two banks, the spare one not being connected. The

FIG. 19.—POWER HOUSE NO. 2.

transformer "railway system" is also dispensed with, simple rollers being provided instead. In the event of an accident to one transformer its bank may be disconnected, the leads removed from the affected transformer, water pipes disconnected and the transformer skidded to one side. The spare transformer can then be skidded into place and connected up and the entire job performed in about one hour, certainly a short enough time for a system of this character.

In connection with all of the power stations, the question of the operator's comfort has been given proper attention. From a practical business point of view, this is a paying investment, as a much better class of men can be procured. Comfortable cottages are provided, the surrounding grounds are cultivated and a small ice plant is a part of the standard equipment. A few fruit trees and a garden will not only greatly improve the looks of the property, but will also greatly reduce the boarding-house expense.

TRANSMISSION SYSTEM.

As shown in Fig. 7, the transmission system is in the form of a figure 8 or a double ring. In this way current is available at both sides of any substation, thereby giving all of the advantages of duplicate lines. The main transmission line from power houses Nos. 1 and 2 feed in at the northeast corner of the system and the line from the Tule River plant feeds in at the center of the system. The steam auxiliary is in the northern ring and can consequently feed both ways. The old transmission lines have wires spaced thirty-six inches, the sawed redwood poles being spaced 120 feet apart. The new transmission lines in the valley consist of a double circuit, the 34,000-volt lines being placed on one side of the pole and a 6,600-volt distributing line on the other side. The circuits form equilateral triangles, the apex of which point downward; the wires are spaced thirty-six inches apart on each circuit. The main line from the Tule River plant consists of one circuit, the poles being of cedar thirty-five and forty feet in height and spaced 300 feet apart. On all new lines a pole spacing of from 300 to 420 feet is used, with thirty-five- and forty-foot poles, depending on the character of the country.

The current is distributed from twelve substations situated in the various towns and settlements, and the transmission and distribution systems are laid out to provide for additional substations as the load increases. The substation construction varies, all but one having started in the same way, namely, as a cheap wood or galvanized iron building with the most simple switching apparatus, and, as the substation grows in importance, substantial brick buildings are constructed with more or less elaborate switching gear, storerooms and offices.

The power is distributed at 6,600 volts and 2,200 volts, two-phase, the first distributing being at 2,200 volts; 6,600 volts eventually proved more satisfactory on the power circuits. The city lighting systems distribute at 2,200 volts, two-phase, with the exception of two new systems, where three-phase has been adopted. There are 246 miles of 6,600-volt line, fifty-three miles of 2,200-volt line, and twenty-eight miles

of lighting circuits of 2,200 volts and about the same length of low-voltage line with a connected load of 1,190 kilowatts of lighting transformers. The consumer supplies the secondary transformers for power supply and the power is measured on the primary side of these transformers.

EFFECT OF POWER PUMPING ON LAND VALUES.

While some exception may be taken to the statement that the development in this section is due almost entirely to the application of electric power for pumping purposes, it is, at the same time, believed to be the case, and this seems to be proved by the land values where pumped irrigation has been established.

Unimproved lands lying south of Porterville sold in 1890 for from $5 to $7.50 per acre, in 1900 for $10 to $15 per acre, and in 1909 for $60 per acre and higher. Lands north and east of Lindsay, which sold in 1895 to 1900 at from $35 to $40 per acre, now sell at $150 per acre. The assessed values of two sections, one three miles northeast and the other one mile west of the town of Lindsay, show that in the first instance the assessed value was $14 per acre in 1890, $36 in 1899 and $91 in 1909, and in the second instance $19 in 1890, $36 in 1899 and $117 in 1909. The above figures represent about the average conditions, there being many cases of increase where the figures have been greatly exceeded.

INVESTMENT VALUE OF A POWER IRRIGATION PROJECT.

The application of a hydroelectric system exclusively for the furnishing of power for pumped irrigation from an investment point of view is not of the get-rich-quick variety. The investor who wishes to receive immediate results on his money should not enter into any such scheme, unless the power company owns the lands to be put under irrigation, when the project develops into a real-estate transaction, the power part being insignificant. Where the project is confined wholly to a power proposition, it should be gone into only by the most conservative investors or developers and pioneers who are content to bide their time and be satisfied for many years without dividends, but with the increased value of their investment. The power company must indirectly meet the opposition of other irrigation districts, and the large government projects, as well as the opposition of gasoline engines and other power, and the charges for service must be as low as possible.

The power company after a few years should show a profit above interest charges and operating expenses, but for every dollar earned several more must be expended on extensions, and, while it is true that, after the system commences to show earnings a great many extensions may be taken care of by bonds, these always require a certain amount of money to be provided by the company. If the development is rapid the stockholders are often required to subscribe additional money aside from the earnings, and must in many cases content themselves solely with the increased value of the property.

When the system is fully developed and loaded the dividends may be large, and the reliability and permanence of the market will often place the stock almost on a bond basis, and in this way a carefully planned and developed hydroelectric system for the supply of power for pumped irrigation may be considered a splendid investment, but never in the light of a speculation. It must be clearly outlined at the inception of the enterprise just what is to be accomplished, for it is a long job and one which requires a great deal of looking into the future.

The final results must be arranged for years before they are obtained and everything shaped to this end. A desire to hasten the marketing of the power may set some precedent which would be most difficult to overcome, and the failure to provide for emergencies may undo the work of years and completely demoralize a system. An overloaded system is to be particularly guarded against, as too much valuable produce depends entirely on the service and any damage to the producer may completely stop development and stifle the entire community. The power company, therefore, has a very large moral responsibility to face, which is not to be lightly considered.

The Copper Situation.

Despite the optimism of the leading copper producers of the country, says *The Mining World*, the June statement of the Copper Producers' Association, on the surface at least, brings with it no joy to the smaller producer. The statement just issued is, emphatically, the most unfavorable of the monthly reports given out by the association. In spite of the apparent borrowing of copper from July to make the June export showing and the shifting of surplus stocks from the United States to various points in continental Europe, there was an increase of practically 8,000,000 pounds in the surplus carried by the domestic producers in this country on the first of July.

The most impressive feature, of course, is the enormous production, which for the thirty days of June aggregated 127,219,188 pounds, or at the rate of 4,240,636 pounds per day. The daily output in October, 1909, was 4,021,216 pounds. In gross lots the production in June was 56,794 tons, which exceeds the October, 1909, output, which was the previous record-breaking producing month by 1,143 tons, or 2,560,320 pounds, but June was a month of thirty days, while October was a month of thirty-one, so that the relative gain over October was practically 6,670,000 pounds.

The statement also shows that the deliveries into domestic consumption were less than 54,000,000 pounds, several million pounds less than the estimate would have been made during the last weeks, but this is the time of year when melting decreases. Consumption in the United States during the first four months this year has been relatively heavier than during the corresponding periods of the last few years; therefore the decrease in the domestic deliveries of 2,000,000 pounds in May and over 7,000,000 pounds, as compared with June a year ago, is most significant.

It is the exports, however, to which special attention is due, it being almost impossible to reconcile the figures as given for June when compared with either the government or the Metal Exchange returns. There is evidence, too, that exports of copper since the first of July, as well as the latter part of June, were largely to warehouses in continental Europe. The returns seem to indicate a shifting of 25,000,000 pounds from the United States to Europe in excess of consumptive requirements.

The surplus in the hands of producers on the first of July, as given by the association, is 168,386,017 pounds, as compared with 154,858,161 pounds on July 1 a year ago.

Ohio Electric Light Association.

Sixteenth Annual Convention Held at Cedar Point, Ohio, July 26, 27 and 28.

The sixteenth annual convention of the Ohio Electric Light Association, which was held at the Breakers Hotel, Cedar Point, July 26, 27 and 28, 1910, marked another forward step in the steady progress of this organization in usefulness and influence. Owing to the fact that the meeting was held at a watering place, there were an unusual number of ladies in attendance, and it has always been a characteristic of the Ohio Association to look after their comfort and pleasure. It must not be supposed, however, that the eighty-eight ladies registered detracted anything from the business character of the proceedings of the convention proper; on the contrary, their influence was for the best. The registration totaled 368, including ladies, and sixty-one central stations were represented, about two-thirds of the entire membership.

In line with the past policy of the Association to encourage the younger men to take an active part, E. H. Beil, of the Youngstown Consolidated Gas and Electric Company, was elected president for the ensuing year. Owing to the removal of retiring-President Rothery to Canada, Mr. Beil has been the acting president for some time, and as such presided over the present convention, and made a very favorable impression as an executive officer.

Much of the success of the Ohio Electric Light Association has been due to the interest taken by its able secretary, D. L. Gaskill, of Greenville, Ohio. Mr. Gaskill possesses a genius for organization. He has a faculty of making people feel at home, and under the influence of his magnetic personality all formality melts away. If the weather is hot and Gaskill takes off his coat, the rest of the coats all go off, and the result is that cordial good feeling and informality which tends to bring out the best that there is in the way of discussion and social interchange.

The O. E. L. A. is a clearing-house of ideas between the central station men and the supply men, and the supply men one and all have worked hand in hand to further its purposes and increase its membership.

Mrs. Clara Turpen Grimes contributed inspiration to the two dinners given by the Association by her solos, Tosti's "Good-Bye," "The Song of the Soul," "Jane," "The Holy City," and at the close of the banquet "God Be With You Till We Meet Again." Mrs. Grimes was repeatedly encored.

Another appreciated feature of the banquet was the sleight of hand with cards by Thomas B. Arnold, of St. Louis, who showed some of the same incomprehensible tricks with which he entertained President Taft's party on the way down the Mississippi River with the Lakes to the Gulf Association.

Among other features was the Tuesday afternoon euchre for the ladies, the prize-winners being Miss Louana Meeker, first prize, handsome cut-glass pitcher; Mrs. F. M. Tait, second prize, fern dish; Miss Mary Whitely, third prize, silver fork. In the bowling contest for the ladies Wednesday morning, Miss Willis took the first prize, a brass jardiniere; Mrs. Smith, a belt pin, and another prize, the name of the recipient of which was not learned. Thursday afternoon, Five Hundred for the ladies, first prize, silver tray, Mrs. E. H. Beil; second prize, necklace, Mrs. E. A. McKnight; third prize, hammered-brass jardiniere, Mrs. Clara Turpen Grimes; while Miss Elmina McKnight took the consolation prize, a hat pin.

Besides card parties, there was a boat ride on Sandusky Bay, musicale, and a theater party for all, so that although the meeting was not held in a large city there was no dearth of entertainment, and there was always the bathing to fill in the gaps.

GENERAL PROCEEDINGS.

At the first session of the convention, on Tuesday afternoon, Secretary Gaskill announced that President J. C. Rothery, who has removed to Canada, had hoped to be present at the convention, but at the last moment found it impossible to do so, and said that his mantle would fall upon the shoulders of an excellent substitute, Vice-President E. H. Beil.

Mr. Bechstein occupied the chair during the presentation of Acting-President Beil's address, an extract of which follows:

PRESIDENT BEIL'S ADDRESS.

The Association has shown a solid and substantial growth, and at the present time but few Ohio central station companies' names do not appear on the list. The organization holds a prominent place among similar bodies, ranking second to the National Electric Light Association only. The value of the Association cannot be overestimated, affording as it does an opportunity for exchange of ideas, and in its broader influence the opportunity for effecting fair and reasonable legislation and opposing unjust and unreasonable measures. Whatever affects the smallest lighting company is of interest to every company in the Association, and it is incumbent upon every member company to give to the Association its sincere support. There has been a great development in the incandescent lamp and while a short time ago the increase in the efficiency of the lighting unit was a source of apprehension to the central-station manager, enterprising methods and a conscientious realization of the obligations of the company with respect to its customers, have made increased efficiency a welcome development.

Mr. Bechstein then welcomed the convention to Cedar Point, congratulated it upon the large attendance, and hoped that all would return next year.

The annual report of Secretary-Treasurer Gaskill was read, containing an itemized list of receipts and expenditures, which was referred to the finance committee for auditing, and later approved by them and accepted by the Association and filed. It contained, in addition to the financial items, an acknowledgment of indebtedness for the valuable assistance rendered during the year by Messrs. Beil, Richards, Tait and Hanley, and an appreciation of the cordial and generous support given the Association by the associate members and others who placed advertisements in the souvenir program. It stated that pursuant to the action of the executive committee the Association has now been incorporated under the laws of Ohio, and the executive committee constitute the directors of the corporation. The secretary recommended that this convention formally adopt a motion directing the executive committee to so act; a motion to this effect carried. The report of the finance committee, J. F. Kermode, chairman, was read and adopted.

F. M. Tait, chairman membership committee, reported favorably upon

the following applicants for membership, and they were duly elected, viz.:

ACTIVE MEMBERS.

The Ravenna Gas and Electric Lighting Company, E. C. Lindsey, secretary and superintendent, Ravenna; The West Unity Power and Lighting Company, A. M. Miller, president, West Unity; The Consumers' Electric Company, Frank A. Baer, manager, Forest; Ansonia Lighting Company, J. E. Wolf, secretary, Ansonia; The Ironton Electric Company, A. L. Thoma, superintendent, Ironton; The Defiance Gas and Electric Company, David Elder, superintendent, Defiance; Richwood Electric Light Company, Edward A. Schambs, Richwood; Stillwater Valley Electric Plant, L. A. Rearson, West Milton; Bedford Electric Light and Power Company, E. P. Chapin, treasurer, Bedford; Barnesville Gas and Electric Light Company, J. W. Bradford, president and treasurer, Barnesville; The Crawford County Gas and Electric Company, R. V. Morgan, secretary and superintendent, Galion; The Hillsboro Light and Fuel Company, L. Beecher, treasurer, Hillsboro; The Tiffin Gas and Electric Company, Tiffin, O.

ASSOCIATE MEMBERS.

The Robbins & Myers Company, C. F. McGilvray, president, Springfield, O.; Crocker-Wheeler Company, Clarence E. Delafield, Ampere, N. J.; Ridgway Dynamo and Engine Company, H. C. Hale, manager, Cleveland, O.; The General Incandescent Lamp Company, H. C. Rice, vice-president, Cleveland, O.; The American Conduit Manufacturing Company, H. B. Kirkland, vice-president and general sales manager, Pittsburg, Pa.; Charles L. Kiewert Company, H. B. Parkey, president, Pittsburg, Pa.

D. L. GASKILL,
Secretary-Treasurer, Ohio Electric Light Association.

M. E. Turner, of the Cleveland Electrical Illuminating Company, not being present, action upon the amendment to the constitution heretofore proposed by him with regard to the personnel of the nominating committee was deferred.

OFFICERS AND COMMITTEES.

Special standing committees were appointed for the ensuing year, as follows:

Committee on Electrical Transmission—J. T. Kermode, Cleveland; W. S. Townsend, East Liverpool; John Gilmartin, Toledo.

Committee on Motor Applications—E. A. Bechstein, Sandusky; C. I. Crippen, Youngstown; B. H. Gardiner, Dayton.

Meter Committee—John Gilmartin, Toledo; O. H. Hutchings, Dayton; J. T. Kermode, Cleveland.

In the selection of the nominating committee, the plan outlined in Mr. Turner's proposed amendment was pursued, and the committee consisted of the two retiring members of the executive committee, W. P. Engel and

E. H. BEIL,
President, Ohio Electric Light Association.

W. F. Hubbell; two members elected from the floor, S. M. Rust and S. A. Plymale, and the fifth member appointed by the chair, W. J. Hanley. The report of this committee was presented at the concluding session of the convention by Mr. Engel, and with the exception of the name of H. B. Rogers, Columbus, Ohio, for whom Paul Stewart, of Cincinnati, was substituted, the report was unanimously adopted and the nominees elected, as follows:

President, E. H. Beil, Youngstown.
Vice-president, W. C. Anderson, Canton.
Secretary-treasurer, D. L. Gaskill, Greenville.
Executive Committee—E. A. Bechstein, Sandusky; Shelton Roberts, Columbus; J. C. Martin, Wilmington; W. S. Townsend, East Liverpool; W. E. Richards, Toledo.
Advisory Committee—Samuel Scovil, Cleveland; F. M. Tait, Dayton; D. L. Gaskill, Greenville.
Publicity Committee—E. L. Booth, Bellaire; C. M. Lott, Hicksville; Claude C. Smith, Bradford.
Finance Committee—J. T. Kermode, Cleveland; C. A. Plymale, Gallipolis, B. H. Gardiner, Dayton.
Membership Committee—W. J. Hanley, Cleveland; E. Van Winkle, Cincinnati; P. J. Williams, Columbus; F. C. Colwell, Cincinnati; N. C. Cotabish, Cleveland; J. M. Cassell, Cleveland; Paul Stewart, Cincinnati.

Following the election of officers, F. M. Tait, of the Dayton Lighting Company, passed a high encomium upon the work of Secretary-Treasurer Gaskill and moved an increase in his salary. Mr. Martin highly agreed with all that Mr. Tait had said, and hoped that from time to time Mr. Gaskill might be furnished such funds as would enable him to take up matters of general interest to the Association, to some of which lack of means has heretofore prevented attention being given. The manufacturers have always supported the efforts of the Association and he was sure that they all realize that the success of the central station men means their success. He suggested as a possible avenue for further investigation and accomplishment the matter of fire and casualty insurance. Mr. Martin's only regret was that the entire membership of the Association could not be present to vote upon the proposition of increasing the secretary-treasurer's salary, in evidence of their high appreciation of his labors and usefulness.

The motion carried unanimously. Mr. Gaskill acknowledged the compliment paid him, while declaring that he had always worked for the Asso-

W. C. ANDERSON,
Vice-President, Ohio Electric Light Association.

ciation's interest, and proposed to continue to do so whether his salary was increased or not.

On motion of Mr. Tait, resolutions were adopted thanking Mrs. Clara Turpen Grimes, soloist; Mrs. Mannix, accompanist; T. B. Arnold, and the Cedar Point Resort Company, with particular reference to Mr. Ryan, manager of the park.

TUESDAY'S PAPERS AND DISCUSSION—TURBINES.

In the discussion of the paper by W. C. Anderson, of the Canton Electric Company, on "Low-Pressure Turbines and Their Operation," an abstract of which was printed last week,

W. S. Culver, of the General Electric Company, said that he could not improve upon the paper, and added that Mr. Anderson has a connection between his heating system and the lower stages of the turbine, so that when the demands of the heating system are light the excess steam can be used to advantage in the turbine, and when the demands of the heating system are heavy steam can be exhausted from the turbine over into the heating system, this portion of the steam not passing through the condenser.

Owing to the Columbus street car strike, the Columbus people were unable to attend the convention, and the paper by Frank Brosius, of the Columbus Railway and Light Company, on "Turbine Troubles," was read for him by Mr. Tait. An abstract of this paper was printed last week. In the discussion of it Mr. Tait said that the paper had only served to confirm in him the impression that he had always entertained that superheat is bad on reciprocating steam engines and steam mains.

Mr. Culver thought that it was quite true that there have been very contradictory experiences reported regarding superheat by different authorities, and objections have been urged because of troubles with steam fittings, but still he contended that superheat can be and is being used to the entire satisfaction of both the users themselves and all others concerned, and certainly with great gain in economy.

Mr. Bechstein asked whether any one was operating turbines with direct connected exciters; if so, with what success?

Mr. Beil replied that his company had had a 2,500 kilowatt turbine set installed for something like two years. It has a direct-current exciter on the end, and he believed they had no particular trouble with it.

WEDNESDAY MORNING SESSION.

The Wednesday morning session was opened with announcements by Secretary Gaskill, several reports of committees and the appointment of new committees.

The first paper was entitled, "Motors for Single-Phase Circuits as They Are Today," by Prof. F. C. Caldwell of the Ohio State University.

SINGLE-PHASE MOTORS.

There are six more or less distinct types of motors which can be operated on single-phase current. They may be termed: shunt, series, simple induction, split-phase induction, simple repulsion, and repulsion-induction. Very small motors of the shunt type have been used, but only to a limited extent, as conditions are not good. The series motor is used principally in railway work. It has been highly developed and has characteristics of direct-current series motor, though inferior in efficiency, weight and cost. In the single-phase induction motor we have the revolving field; one component due to the external field, the other to the cross flux produced by the armature current. Consequently this motor must be brought up to speed before it will run, since there is no cross field before starting. Some method must be provided to start it. The simplest is that used in the split-phase motor, which is started as a two-phase motor and runs as a single-phase motor after attaining speed. The second phase is supplied by an auxiliary winding of high reactance which is automatically cut out at full speed. The starting torque is low in this motor, and clutches must be provided enabling it to take up the load after attaining speed. The repulsion type has a simple field, an armature like a direct-current machine and brushes short-circuited. The brushes must be placed unsymmetrical with respect to the poles. The characteristics are similar to a direct-current series motor. By starting in this way, short-circuiting the commutator after attaining speed, and then running as a simple induction motor, the advantage of high starting torque is obtained. Starting may also be accomplished as a series motor. In the repulsion-induction motor, besides the two usual brushes, there are two others, spaced ninety degrees from the first set. The conpensating circuit, which connects these brushes, passes through a portion of each of the main field coils, so that this circuit receives a part of the voltage applied to the machine. By resistances in the compensating circuit, adjustable speed may be obtained. This motor has a high power-factor. A table is given containing operating data of the motors of ten different manufacturers. On account of the complication involved in the various types of single-phase motors, they are essentially more expensive than polyphase, but this is often more than offset by the decreased cost of circuits and transformers due to the two instead of three wire distribution. The lower iron loss in the one transformer instead of two or three small ones is also to be considered.

There was a brief discussion of this paper and the next paper, entitled "What Progress Is Being Made in the Introduction of Electric Vehicles in Ohio?" by J. T. Kermode of the Cleveland Illuminating Company, was read.

INTRODUCTION OF ELECTRIC VEHICLES.

The central stations must inaugurate a system of inspection of batteries and transmission gearing that will insure good operating results to the owners of electric cars. This does not necessarily mean the establishment and operation of garages by the central station, but does mean the employment by the central station of labor skilled in electrical and mechanical engineering pertaining to electric vehicles, in order to educate the public garage men in care and maintenance of batteries and transmission, and the owners of cars in care of charging and in the knowledge of results that should obtain from the services of necessity performed by the garage. There are in Ohio 1,796 electric vehicles registered of which 1,030 are in Cleveland. There are 596 private charging stations in Cleveland and fourteen public charging stations. Of the private stations 408 use mercury rectifiers and 188 use motor-generators. The inherent regulation of the mercury rectifier is an advantage, and when the electromotive force of the battery approaches the voltage of the rectifier it cuts out automatically. Figures are given of the current used by these customers. A valuable asset to every private charging plant is a discharge rheostat for the purpose of completely discharging the batteries occasionally. This should be thoroughly explained to all owners of electric cars so that they may realize the importance of treating their batteries properly. Foremost among the advantages of electric delivery wagons and trucks are: saving in time, prompter deliveries, increased territory that can be served, greater volume of business with less delivery equipment, cleanliness, freedom from liability of fire, lower insurance, simplicity of operation, permitting the employment of drivers at the same wages as a horse-drawn vehicle, and the advertising value received by the general satisfaction given to the customer served. The successful operation of these cars depends upon mechanical conditions. Too much stress cannot be laid on the importance of systematic inspections, frequent cleaning, oiling and adjusting of all parts that might have a tendency to increase the friction losses. A slight increase in friction may in many cases reduce the work of the wagon 25 per cent or more. Numerous instances have been cited where failures in electric trucks can be directly traceable to ignorance of selection, a wagon capable of taking care of an occasional abnormal load being purchased instead of one suitable to operate under the daily average conditions.

The next paper, entitled "Methods to be Pursued in Getting New Business in Cities of 15,000 and Less," by L. A. Pettit, Jr., Middletown Lighting Company, closed the morning session.

METHODS OF OBTAINING NEW BUSINESS IN CITIES OF 15,000 OR LESS.

This paper emphasizes the value of new-business departments and outlined the functions of such departments. It pointed out the value of co-operation in the organization of a company and the care that must be selected in employing help. Other important matters considered are a display room and advertising. It is not necessary to equip an elaborate electric shop, having expensive decorations, and to display every electrical contrivance that is manufactured. Have a suitable space in front of the cashier's window equipped with a wall case such as is used by jewelers, a display rack arranged to show the cost of operation of various types and sizes of lamps. Display such appliances as are within the reach of the pocket-book of the average customer, appliances that might be classed as necessities rather than luxuries. Arrange with manufacturers to furnish washing machines, vacuum, cleaners, pumps, coffee mills, food choppers, forge blowers, and small machine tools on thirty or sixty days consignment for demonstrating purposes. Have as large a display window as possible and make it attractive. Place in it mechanical displays, demonstrators, etc. Change this display every week. Remember that one thing well displayed is better than to have the window filled with something which does not pertain to your business. Make it distinctive. Keep the people's attention fixed. Last, but decidedly of no less importance, is to have it properly illuminated. The advertising need not be elaborate. The use of stickers on bills, posters on bill boards, attractive post cards sent direct by mail, transparency signs in manholes along the sidewalks, and lantern slides used on the screens in theaters produce the maximum results. The author was of the opinion that owing to the

usual high rates for space and the small circulation, newspaper advertising will not prove very practical in the smaller cities, only for use during special appliance sales or campaigns.

WEDNESDAY AFTERNOON SESSION.

The Wednesday afternoon session was opened with the reading of papers by Claude Smith, of the Bradford & Gettysburg Electric Light and Power Company, and C. C. Custer of the Miami Light, Heat and Power Company, entitled "Experience with Series Tungsten Lamps for Street Lighting."

EXPERIENCE WITH SERIES TUNGSTEN LAMPS FOR STREET LIGHTING.

Mr. Custer stated that his company had been using 32-candlepower series incandescent street lamps about ten years, the old carbon lamps having been replaced successively by Gem and tungsten lamps. The average life of the carbon lamps was about 1,200 hours, of the Gem lamps, 800 hours, and of the tungstens actually in service about 3,300 hours. However, quite a few tungstens were found defective after short use and these were not paid for nor figured in the average life. Aside from some blackening and considerable trouble at the junction of the filaments and leading-in wires, which troubles are eliminated in the latest lamps, the tungstens have given excellent service and are the only lamps worth considering in series incandescent street lighting. They have a better quality of light, much longer average life and stand surges of current better than any carbon lamps. As a ready means of noting opens in series circuits a small pilot lamp is put in series with the circuit and energized from the low-tension three-watt system when the circuit is not regularly operating. Mr. Custer recommended the large series Edison fuse lamps with new style mica-strip cut-out in preference to the T-H base lamps with paper-film cut-out.

Mr. Smith's company installed the first of its series tungsten circuits in November, 1908, and has since added several more such circuits, each using sixty candlepower lamps. These are suspended on sixteen-foot mast arms built by the local linemen from piping at a cost of about $4 each installed on the poles. On the sixty-light circuit seven lamps were broken by storms, wind or boys throwing stones; forty-five were found defective after a few hours use and replaced by manufacturers, while fifty-seven burned out. Mr. Smith gives 2,311 hours as the average life, although four lamps were still in service after 5,280 hours. The lamps on each series circuit are fed from a 220-volt circuit through variable-tap step-up transformer and series regulator. Both low and high-tension sides are protected by lightning arresters and each circuit is controlled by an eight-day time switch. These switches gave a little trouble from stopping in cold weather, which was remedied by placing within them small heating elements. Gauze-film cut-outs were first used but were replaced by the more reliable mica-strip cut-outs. The residents are well pleased with the lighting installation.

This paper elicited quite a little discussion, several of the members telling of their experience with the series tungsten lamp. The consensus of opinion was very favorable to this form of lighting.

The paper entitled "Tungsten Lamps vs. Central-Station Earnings," by E. L. Booth, was then read.

TUNGSTEN LAMPS VS. CENTRAL STATION EARNINGS.

The introduction of a source of light promising the same amount but higher grade illumination with only one-third the energy consumption and therefore possibly two-thirds reduction in revenues was justly viewed with alarm by a majority of central stations. Extended inquiry showed that the revenue from old lighting customers was reduced from twenty to forty per cent through the use of tungsten lamps. Because the consumer could secure the same illumination at only one-third his former current charge, he has actually preferred to buy his own relatively costly and fragile tungsten lamps to using the old lamps that were freely supplied by the central stations. The use of a more efficient means of converting electricity into light should certainly also create an economic saving to the central station. Under the prevailing methods of charging for electrical energy the economic saving from the use of tungsten lamps goes to the consumer only, especially if the charge is on a straight kilowatt-hour basis. Fortunately, many consumers, particularly merchants, are content to spend a certain amount for lighting, increasing their equipment by the saving in energy. Residence customers are not so likely to do this, however, so the station must secure new customers for the plant capacity rendered idle. If new distributing lines have to be constructed for this purpose, the fixed charges will be materially increased. For this reason many companies prefer to use the flat rate charge with current-limiting device to control maximum demand of customers using tungsten lamps. But a system of charging which promises most to the control station is one which secures the larger part of the income from the service rendered rather than from the energy consumed. The greater portion of the total expenses are dependent on the maximum demand of the customers and on the number of customers. Therefore these expenses should be combined and applied to the consumer as a service charge which must not be prohibitive nor hinder the installation of current-consuming devices by imposing a charge on connected load. The kilowatt-hour rate should be so low that a reduction in current consumption through the use of high-efficiency lamps or other devices, could never reduce the revenue derived from the consumer below the fixed cost of serving him. Hence, the effect of the tungsten lamp upon the control station's earnings resolves itself into the question of rates and the ability to secure added business, particularly off-peak load. In conclusion, Mr. Booth urges central-station men to get together and formulate a uniform method of charging for electrical service and energy.

M. D. Cooper of the engineering department of the National Electric Lamp Association indorsed in general the suggestions made by Mr. Booth. He believed that the straight meter rate is slowly but surely becoming a thing of the past. The engineering department of the National Electric Lamp Association has been devoting considerable time to the subject of the rate situation in an effort to be of assistance to the central stations of the country with respect to the question of rate determination. While this investigation has been confined mainly to a study of steam plants in fairly large cities, the analyses have shown rather unfortunate results. Compilation of statistics by S. E. Doane, chief engineer of the association, shows that for an average station about 14.6 per cent of the total annual cost depended upon the number of customers served; 55.1 per cent upon the size of the plant or upon the maximum demand for power, and 30.3 per cent upon the output in kilowatt-hours. A reasonable division of the charges seems to indicate a trinity which might be indicated as a demand charge, customer charge and output charge. The customer charge will vary according to the demand. In some cases it might be well to make use of a flat meter rate. Flat rates based on guarantee demand need not be feared, for the class of customers with whom the difference between $1.50 and $2 for the monthly bill decides the question of electricity or no electricity, would undoubtedly use high-efficiency lamps to keep down the demand, and if they bought their renewals they would be careful about needless burning.

THURSDAY MORNING SESSION.

The Thursday morning session was opened by the reading of a paper entitled "Central-Station Facts and Factors," by J. R. Cravath.

CENTRAL STATION FACTS AND FACTORS.

Attempts have been made at various times to collect information from electric light and power companies covering various points in finance and operation. These attempts have in many cases been unsuccessful especially in those plants not operated by syndicates. As a result of a former investigation the writer has already compiled several tables entitled "Central Station Facts and Factors." Figures have been tabulated for plants operating in the State of Iowa, and the object of this present paper is to carry the investigation into Ohio. The data secured from these plants shows clearly the conditions and the cost of operation of the plant. It is unfortunate, however, that more of the companies did not respond to the request for information. The table compiled from the figures secured is interesting and it may be noted that the averages obtained from the twenty-six Iowa stations compare very closely with those of the Ohio plants. The lesson to be learned is obvious. Liabilities per kilowatt should be kept as low as possible; gross yearly income per kilowatt should be pushed up, as should gross per $100 liabilities; the ratio of operating service to gross receipts should be as low as is consistent with good service. As a general thing stations with considerable connected motor and heating load stand a better chance for good earnings than those of the small motor and heating loads. The kilowatt-hours sold or accounted for should be high, and the transformer capacity should not be too much in excess of the average capacities found by these investigations. Small companies generally operate at a greater margin of profit than the larger companies. That they do not make a better showing is due to the difficulty of securing proper management.

Mr. Gilmartin queried whether Mr. Cravath could throw any light on why the average load factor is so much higher in Iowa than in Ohio, Iowa being shown on the table as 32, and Ohio 26.8; and the average is higher in Iowa than the maximum in Ohio.

Mr. Cravath replied that he was not sure, but his impression was that that is due to the fact that more of the Iowa companies have had power service and have developed the power business more. There are a number of companies reporting on this table that do not have day service, which of course brings their load factor down, because the load factor is figured on a twenty-four-hour basis. The Iowa average is high, however.

Mr. Pointer asked whether those companies which did report in Iowa stated whether they were using water power, or steam power. If they use water power they could furnish power very much cheaper than if they use steam, and they would get more of it. There are very few water power motor plants in Ohio.

Mr. Cravath replied that as a matter of fact he knew that Iowa has less water power than Ohio. A smaller proportion of plants are using modern power there; it is a very level prairie state and difficult to find water power.

Mr. Martin thought that this matter is of such value and importance to central stations that it would be a good plan for one of the association's committees shortly after this convention is concluded to prepare a schedule of questions and send them out and try to secure throughout the coming year a report upon these matters, which report could be turned into the secretary and some one authorized to prepare a paper giving the results to the next annual convention.

Mr. Martin also desired to refer to the question of day load. His company has at present only one 250-kilowatt and one 125-kilowatt machine, yet they have 500-horsepower connected load, and frequently the card as taken from their engines indicates that they are pulling over 400-horsepower at two or three o'clock in the afternoon; so that their day load has outgrown their night load, and the plant is virtually a power plant instead of an electric lighting plant, the only trouble being the low rate with which they started in with the power customers, which might be termed a flat rate per horsepower. That arrangement the speaker was glad to say was drawing to a close, and for the last two years they had contracted with meter customers.

Mr. Gaskill moved that the matter of collecting further information on similar lines to those laid down in Mr. Cravath's paper be referred to the Committee on Publicity in connection with Mr. Cravath's, to report at the next annual convention. The motion carried.

The chair called on C. W. Lee, suggesting that he might have something to say on this matter that would be interesting; to which Mr. Lee responded.

H. G. Glass, of the Westinghouse Electric and Manufacturing Company, read a paper, entitled "Securing Off-the-Peak Load."

GROUP AT CONVENTION OF OHIO ELECTRIC LIGHT ASSOCIATION—LEFT HALF.

SECURING OFF-THE-PEAK LOAD.

It is an accepted fact that a good day load is necessary in order to secure a high station load factor, a low cost of production and a reasonable return on the investment. It is evident that very few industrial plants are changed over from mechanical to electrical drive through sentiment alone; it is necessary to show the economies which will positively result as a consequence of the change over. What these economies are in any given industry, the central station solicitor must determine by a careful study of the particular industry to be changed, and the plant itself. Very frequently a central station solicitor may be able to recommend slight changes in the arrangement of the machines, or in the method of driving which will materially improve the manufacturing conditions. Such opportunities for possible improvement should always be borne in mind, as a customer will be more willing to have them made with the complete change over than at some other time. In installations in machine shops and woodworking plants, the great tendency of solicitors is to apply motors to a few line shafts and make but few changes in the drives of the machines. While this is undoubtedly an improvement in the operating conditions of the shops, it will not secure to the customer the greatest advantages of electrical power. The solicitor should in all cases endeavor to secure the maximum return to the customer per kilowatt-hour of energy sold by the installation of individual motors applied for maximum convenience and productive capacity, and should not be satisfied with a half-way job. Those plants which can afford it, should have a consulting engineer with a good mechanical and electrical training and a good amount of common sense, to be at the call of their customers. This man will become the most valuable of any in the operating department, as he will be continually building up confidence in the company, and, at the same time, take care of the company's interests in seeing that the proper sizes and types of motors and electrical equipment are installed. In the beginning of the campaign for more power, all the possible power prospects in the territory now served by central-station lines and that can be served by extensions, should be classified according to industries. There are three main divisions into which the industries will fall, first, those which derive the greatest benefit from electrical service, because of their low load factor and consequent high investment charge per unit of power used, if they generate their own power; second, those whose demand is largely constant throughout the

day, but whose scattered location of buildings, etc., demands an economical system of power distribution; and, third, the long-hour power users who can be persuaded to use power after midnight and before the day load begins, thus justifying a very low rate for power. In developing off-peak load the first problem the central station man must solve is how to make rates that will attract this business and yet be profitable. They must get their cost to produce down and keep the efficiency up at the same time.

In going into a profitable load-factor-increasing the first essential is service. The second is the personnel of the organization from the coal heaver up. The third essential is the policy of the company.

H. Engle wished to put two questions; first, as to those companies that are not located on the main thoroughfare, what provisions do they make to extend the use of heating appliances? Secondly, with regard to those companies who rent offices on the main thoroughfares in order to display heating appliances, do they find that the proposition is a paying one? Do they sell enough apparatus so that it will offset the higher rent, or in general do they find it a paying proposition?

Mr. Gardner said that his company had quite an experience in that line. They are not on the main thoroughfare and are at quite a disadvantage in that way. They rented a display room on one of the most prominent corners in the city and went to a great deal of trouble putting up and outlining a very fine window to display heating appliances of all kinds, everything that was manufactured. They maintained that display room for two years and then decided that they had realized the extent of the advantage that they could gain from that investment, and moved back to their old office. He did not consider that it was a good plan to maintain such a display indefinitely, but as an advertising scheme for a year or two he did not think money could be spent to better advantage. Equal returns could not be derived from any other form of advertising. So far as the sale of appliances themselves was concerned the profit from that did not pay the rent in this case, although in a small place where rents are low he thought it would do so. Regarding the paper by Mr. Glass, he wished to refer to one statement by Mr. Glass where the latter had said that he did not think it would be well to put down on cards the rate and the customer's name. He could not agree with that idea, as he believed that the secret of any station's success will be found in treating everybody alike in all cases.

GROUP AT CONVENTION OF OHIO ELECTRIC LIGHT ASSOCIATION—RIGHT HALF.

Mr. Glass replied that in going through the country he had found about as great a diversity of rates as there was a diversity in the types of towns and cities, and what he suggested was what he thought would recommend itself favorably to the convention members as to methods.

Mr. Gardner replied that one way of handling heating devices at the present time that has been found to give very good results is when wiring a residence to put up a little sticker of some kind calling attention to the sale of electric irons, toasters, stoves, etc.

Mr. Martin made a somewhat lengthy but exceedingly forceful and interesting address upon the subject of getting motor and other business. He is located in a town of some 4,000 to 4,500 population, and about five years ago conceived the idea of putting on a power circuit. His board of directors was evenly divided on the proposition, and after he had presented the subject as well as he knew how the president cast the deciding vote, and he went ahead. He described in detail the ingenious ways in which he had secured one factory after another in the town until he had seventeen out of twenty, or eighty-five per cent, and had made every one of them a friend of his company. For the planing mill he found a market for his shavings and kindling at a good profit, and sold him a motor drive that took care of the entire establishment at considerably less for installation than individual drives would have cost, taking notes payable in amounts each month equaling the amount of the engineer's salary saved by the installation. In the same careful and thorough way he went after each prospect, suiting himself to the special needs of each case. He had put out irons with over fifty per cent of his residence consumers; if there was a church fair Martin was there with his offers of irons, toasters, cookers, etc., which went off on a guessing contest, and Providence recognized the kind act and brought in a number of consumers for the articles given away, who paid for current. As to rates he believed the thing to do was to treat the public liberally as possible and always be fair with them; a public commission bill and a public utilities bill may be looked for at the next session of the Ohio legislature, and the thing to do is to get ready for them by arranging a schedule of rates so as to forestall any possible criticism.

B. H. Gardiner, of the Dayton Light-

ing Company, read a paper entitled "Outlines of an Equitable Power Rate."

OUTLINE OF AN EQUITABLE POWER RATE.

This paper commented, in a general way, on the status of the power rate at the present time. The author is of the opinion that other points are of more importance than the question of price obtained per kilowatt-hour and outlined a power rate with this thought in view. To try to determine some adequate and just rate the author assumes a central station having a capacity of 1,000 kilowatts and the total investment in generating plant, lines and property of all descriptions is $300,000 or $300 per kilowatt of capacity. The first charge considered is the interest and depreciation charges on this investment. In each plant these amounts should be determined by taking into consideration the life of different pieces of apparatus, material, etc.

The author assumed 6 per cent interest and 6 per cent depreciation for the hypothetical plant, which makes the total fixed costs $36,000. The operating expenses were analyzed and the grand total assumed to be $25,200. Of this amount $11,683.33 represents fixed expenses, while $13,516.66 represents expenses that vary more or less directly in proportion to the kilowatt-hour output. Adding to the fixed operating expenses the interest and depreciation items which have been assumed to equal $36,000 will give as the total fixed expenses $47,683.33.

The output of this plant was assumed to be 115,000 kilowatt-hours per month. Dividing this amount into $13,516.66 will give $0.0098 per kilowatt-hour as the current cost. If in this plant the unaccounted-for current amounts to 22.5 per cent then the total cost of current delivered to the customers' premises $0.012 per kilowatt-hour. This amount takes care of the variable operating expenses, but does not consider the fixed expenses. These fixed expenses which were found to equal $47,683.33, on a basis of 1,000 kilowatts, would equal $47.68 per kilowatt demand. Based on hours' use per month of the maximum demand, the fixed costs per kilowatt for different hours' use of demand were figured. To these fixed expenses were added the operating cost of $0.12 for each kilowatt-hour, making the total cost of one kilowatt of demand:

30 hours use per month...$0.1445 per hour
60 hours use per month... .0788 per hour
90 hours use per month... .0562 per hour
120 hours use per month..... .0452 per hour
150 hours use per month..... .0385 per hour
180 hours use per month..... .0341 per hour
210 hours use per month..... .0310 per hour

Having arrived at these costs the author then established a gross selling price. To begin with, it is questionable if much power can be sold at a cost of $0.145 per kilowatt-hour, even very small quantities. It is advisable to fix the maximum rate at $0.12 per kilowatt-hour, for one hour per day business, it being understood that the company will be protected by a suitable minimum demand and minimum monthly charge. From this point on the author arbitrarily fixed the gross selling price, by adding a percentage to the cost price, this percentage from 110 hours and on being 30 per cent. The tabulated gross selling price is then as follows:

Hrs. Use per month	Per K.W hour	Hrs. Use per month	Per K.W hour	Hrs. Use per month	Per K.W hour
Up to 35	$ .12	115 to 125	.0567	205 to 215	.0403
35 to 45	.115	125 to 135	.0553	215 to 225	.0393
45 to 55	.105	135 to 145	.0525	225 to 235	.0381
55 to 65	.094	145 to 155	.05	235 to 245	.0372
65 to 75	.083	155 to 165	.049	245 to 255	.0362
75 to 85	.076	165 to 175	.048	255 to 265	.0355
85 to 95	.071	175 to 185	.0469	265 to 275	.0345
95 to 105	.0665	185 to 195	.0429	275 to 285	.034
105 to 115	.0635	195 to 205	.0415	285 to 295	.0334
				295 to 305	.0328

Regarding the question of maximum demand and the connected load the author is of the opinion that a good plan to follow is to take a fixed per cent of the connected load as the maximum demand.

M. D. Cooper considered that Mr. Gardiner had not carried his analysis of actual costs quite far enough. There is found to be a difference between the cost of service wiring per kilowatt of demand for large and small customers, and to compensate for this difference Mr. Gardiner has apparently allowed his rate to become less than cost over a certain range. The principal objection to the discount schedule as given in the paper was to take care of the difference in the customer's cost per kilowatt demand. This seems to be a roundabout method of charging for the customer's cost is incorporated with the demand cost and then taken out by means of the discount. It would manifestly make a much simpler rate system to keep the two items of expense separate and make separate charges to cover each of them.

Again, the percentage discount to be given is determined by the amount of the customer's bill. In this the discount schedule works an injustice, for a large customer with a low load factor will not receive any more discount than will a small customer with a high load factor, while, according to theory, a large customer should have a greater discount.

Mr. Cooper analyzed the expense items cited as a basis in determining the rate system proposed by Mr. Gardiner, and this seemed to indicate a high customer charge, although the author practically objects to such a charge.

Mr. Tait inquired of Mr. Gardiner what he included under the term "damages," and whether it included employers' liability insurance.

Mr. Gardiner replied that it might cover anything of that sort. He had put it down as a fair allowance to cover such contingencies that might arise.

Mr. Anderson, of Canton, said that in the fixing of rates for power there is one feature that it is difficult to take care of in any system of charging that has been suggested. The cost of a plant is most of it in the distribution system. Assuming that you have a plant situated in close proximity to a number of large manufacturing establishments, if you are to make your charges based on a very heavy cost of the plant it would be difficult to equalize the prices to be charged customers situated near the plant as compared with those situated several miles away. One of the public commissions has established a rule that the price shall be uniform throughout the territory served without any regard whatever to the cost to the company furnishing the service, which seemed to the speaker to be very unfair and something that would militate against companies endeavoring to get power business, for they would be forced either to sell to unfavorably situated power consumers at a loss, or to charge the others entirely too much.

The convention now took recess to 2:00 o'clock p. m.

THURSDAY AFTERNOON SESSION.

At the afternoon session a paper was read by John Gilmartin, of the Toledo Railway and Light Company, on "Methods of Maintaining Electric Meter Accuracy."

ELECTRIC METER ACCURACY.

This paper is a report on current practices in metering in Ohio. A list of thirty questions was sent out to the operating companies and the answers have been digested by the author and the information put in readable form. The questions are mainly concerned with when, where and how meters are tested.

At the suggestion of Mr. Gilmartin a Meter Committee was constituted to investigate meter conditions throughout the state on lines similarly adopted by the National Electric Light Association and the Association of Edison Illuminating Companies and make a report.

Mr. Gray in reply to a question by Mr. Kermode said that the C.Q. meter, or four-pole meter manufactured by the General Electric Company, has only been on the market about a year. The company feels that this type of meter is going to do away to a certain extent with stray fields.

The concluding paper of the convention was read by R. J. Feathers, of the Columbus Railway and Light Company, on "Best Methods to be Followed in Purchasing Station Apparatus."

BEST METHODS TO BE FOLLOWED IN THE PURCHASE OF STATION APPARATUS.

When contemplating the purchase of station generating apparatus consideration should be given not only to the purchase price but to the cost of operation after installation. It may be that a relatively cheaper, in first cost, machine may be much the more expensive when operating costs are considered; to this end it is important that the apparatus be highly efficient, also capable of withstanding overload for a reasonable period, have in direct current machines excellent commutation preferably equipped with commutating poles which will permit for a short period the overloading of such machines to a point far in excess of that which would be practicable with the

older type of machines having a neutral point that shifts and causes sparking at the brushes with every change of load. The feature of excellent commutation is important as a machine which sparks and burns and which needs sanding or stoning frequently, or on which the commutator may require turning often, as this is a source of expense in maintenance; it is well to remember that commutator copper is expensive and that the labor required to keep continually nursing the commutator of a machine amounts, in a year, to quite a sum of money to say nothing of the trouble and inconvenience caused by poor commutation. A machine of low rotative speed is to be preferred ordinarily on account of there naturally being less wear and also will probably be a more quiet running machine. In case of purchase for intermittent or occasional service, such as auxiliary for water power plant, probably a machine having a comparatively high rotative speed would be the more economical, as the first cost would ordinarily be less and the up-keep in brushes and attention required be very slight on account of the small number of hours run. In an auxiliary plant of this character the money invested should be as small as possible as in the running of a plant for say two or three weeks per year the relative saving due to the higher efficiency of more expensive apparatus and the money which would be wasted in loss of interest and depreciation on a more efficient plant, could probably be as well spent for a little more coal and attention, as the losses due to the cheaper apparatus would only exist for a short portion of the time, while interest and depreciation charges are continuous. On the other hand, with a plant which is expected to be in continuous operation, the operating costs may with profit be lessened by more efficient and more expensive apparatus. In the case of a machine which is expected to be operated continuously the efficiency and low cost of operation are factors to be carefully considered, as a cheap, inefficient machine may during its life waste more than its original cost by high cost of operation. After a decision has been reached as to what is required in capacity and what character of machinery is desirable, also what steam pressure will be available, in case the equipment to be purchased is an addition to an already existing plant, a request for complete data and specifications should be made to the manufacturers, requiring them to be especially explicit as regards steam consumption and capacity for over-load for a reasonable length of time, stating that these features are to be given due consideration when deciding on the purchase.

Discussing the paper, Mr. Gilmartin said that one point that struck him was the different ratings given the machine at different capacities and at different temperatures. He had recently gone over some bids from three different manufacturers on a 5,000-kilowatt turbine, and due to the fact stated by Mr. Feathers worked for several days in trying to twist the figures in every way it was possible to get a comparison of the bids on a fair and equal basis, which was very difficult owing to the calculations based on different temperatures. It seemed to the speaker that some of that trouble might as well have been avoided if the request for bids had been more carefully worded and had included the limitations that the company wanted to cover more clearly and more specifically.

Mr. Bechstein suggested the appointment of a committee on motor applications to gather all data on power business and publish same in pamphlet form within the next year after it has been submitted to the association; the manufacturers of various machinery will no doubt be glad to give ratings and suggestions as to the class of motor they would like to have their machines operated by, and it would make very valuable information for central station men to have on file in their offices. The committee was constituted and appointed.

EXHIBITS.

There were a larger number of exhibitors at the convention than formerly and their displays were favorably located, being in the rear of the convention hall which was a very large room and well adapted for this purpose. The banquet was given in the same room so that even while the convention was being entertained the demonstration formed a pleasing background.

The Sterling Electrical Manufacturing Company, Warren, O., in its large, well-lighted and decorated booth showed tantalum Meridian and Mazda Meridian, and the regular line of Mazda lamps, which averaged from sixteen to 400 candlepower. It required about sixty-five amperes to run the display aggregating between 7,000 and 8,000 candlepower, and using from eight to ten horsepower. Handsome fans were presented to the ladies at the banquet. Represented by J. T. Donahue and W. F. Benedict, Warren; H. M. Boyle, Lowellville; M. D. Phelps, Toledo.

The Triumph Electric Company, Cincinnati, had a small display and was represented by D. D. Gill and W. H. Underwood.

The Wagner Electric Manufacturing Company showed a single-phase motor, three horsepower polyphase motor, a set of portable instruments, comprising lamp-testing volmeter and wattmeter, standard single-phase wattmeter, ammeter, and Y-box. Represented by T. T. Richards, St. Louis; Dean Emerson, manager Cincinnati office.

The Westinghouse Electric Manufacturing Company and the Westinghouse Lamp Company showed a complete installation of over thirty street series tungsten lamps mounted on poles along the beach front, operated by a constant-current regulator and controlled by a standard street series switchboard panel. The lamps which were shown had radial reflectors and were of the new wire-type, 6.6 amperes, sixty watts. As there was no direct current available the Westinghouse people installed a complete sub-station with step-up transformer and auxiliary parts. In the exhibit in the convention hall there was a representative line of smaller pieces of apparatus including heating and cooking apparatus and small power motors. The Westinghouse Lamp Company had in operation some ten or twelve sizes of 110-volt and 220-volt wire-type tungsten lamps, ranging in size from twenty-five to 500 watts.

The Nernst Lamp Company, Pittsburg, displayed improved Nernst lamps, which eliminated mechanical skill in lamp trimming and are believed to have reached the fool-proof stage. Attention was called particularly to the new type of Westinghouse-Nernst five-glower which has been put out quite recently.

The Allis-Chalmers Company showed a model of a Parsons type of steam turbine with full spindle, and half section of cylinder; complete assembled transformer, also disassembled transformer; latest type of induction motor; portable air compressor equipped with new ten-inch interurban whistle, and automobile garage hose section for tire pumping.

The Macbeth-Evans Glass Company, Pittsburg, is making a specialty of Alba glass, and exhibited shades in this material for which there is claimed very small light absorption. There were erected in front of the exposition hall two metal standards made by the Jandus Electric Company and equipped with Alba balls for street lighting.

Hubbard & Company were represented by Charles L. Pierce, Jr., and exhibited pole and line hardware, Pierce brackets and other construction specialties.

The Enterprise Electric Company displayed Peerless transformers, sign transformers and new improved house lighting transformers as well as its general line of standard transformers.

The Century Electric Company, represented by R. J. Russell, secretary of the company, showed its popular "Century" single-phase motors.

The Sanitary Pump Company showed electric pumping machinery in operation; automatic house supply pumped by electricity as a substitute for water motor.

The Adams-Bagnall Electric Company had on exhibition several regenerative flaming arc lamps of multiple series type, the latest development in the flaming arc line, burning seventy hours with one pair of carbons.

W. N. Matthews & Brother exhibited the Matthews lineman's protector, two-bolt guy clamp, Matthews guy anchor, lamp-changer, cable clamp and the hold-fast lamp guard.

The Cooper-Hewitt Electric Company was represented by F. B. Allen of Cleveland, exhibited the new type HH mercury vapor lamp.

The Crocker-Wheeler Company exhibited alternating-current and direct-current motors, and numerous photographs of typical installations.

The Fort Wayne Electric Works exhibited one of its latest type compensarcs for moving picture machines; oscillating fan motors; type A transformer, type K, meters and a full line of small alternating-current and direct-current motors, bell ringing transformers, etc.

The Excess Indicator Company exhibited its indicator, and distributed literature in connection with different installations.

The John A. Stewart Electric Company, Cincinnati, distributed souvenir blotters of a special unique design.

The General Electric Company was represented by a number of representatives from its engineering and sales department, and made an incidental exhibit of lighting fixtures, heating devices and accessories.

REGISTRATION.

E. H. Beil, Youngstown Consolidated Gas and Electric Company; Mrs. E. H. Beil; D. L. Gaskill, Greenville Electric Light and Power Company; Mary A. Gaskill; Esther Gaskill; Geo. W. Jones, Dayton Lighting Company; E. H. Heathman, Dayton Lighting Company; A. C. Robeson, Greenville Electric Light and Power Company; John H. Whitely, Greenville Electric Light and Power Company; Ada H. Whiteley, Mary Whitely; J. T. Kermode; Cleveland Electric Illuminating Company; B. R. Buss, Cleveland Electric Illuminating Company; Mrs. B. R. Buss; F. M. Tait, Dayton Lighting Company; Mrs. F. M. Tait; S. M. Rust, Greenville Electric Light and Power Company; Mrs. S. M. Rust; Karl A. Katzenberger, Ansonia Light Company; W. T. Fitzgerald, Greenville Electric Light and Power Company; C. I. Crippen, Youngstown Consolidated Gas and Electric Company; Harry Engle, Youngstown Consolidated Gas and Electric Company; O. B. Welch, Sandusky Gas and Electric Company; Mrs. O. B. Welch; B. H. Gardiner, Dayton Lighting Company; Mrs. B. H. Gardiner; W. F. Hubbell, Wauseon Electric Light Company; L. A. Pettit, Jr., Middletown Light Company; Mrs. L. A. Pettit, Jr.; W. S. Meeker, Greenville Electric Light and Power Company; Louanna Meeker; E. A. Bechstein, Sandusky Gas and

Electric Company; Mrs. E. A. Bechstein; Wm. M. Adams, Elyria Citizens' Gas and Electric Company; Mrs. K. Adams; H. S. Thayer, Cleveland Electric Illuminating Company; F. A. Barr, Consumers' Electric Company; R. O. Morgan, Crawford County Gas and Electric Company; J. C. Martin, Wilmington Water and Light Company; P. Barnhard, Tuscaloosa County Electric Company; Mrs. P. Barnhard; Claude C. Smith, Bradford & Gettysburg Light and Power Company; E. H. McKnight; Mrs. E. H. McKnight; Mannette McKnight; Elmina Mcand Power Company; Mrs. S. A. Foltz; W. S. Knight; S. A. Foltz, Mansfield Railway, Light Townsend, E. Liverpool Traction and Light Company; H. Armstrong, Steubenville and E. Liverpool Railway and Light Company; John Gilmartin, Toledo Railway and Light Company; C. H. Massa, Mansfield Railway, Light and Power Company; Harry C. Turnock, Cleveland Electric Illuminating Company; S. E. Stiles, Cleveland Electric Illuminating Company; W. E. Neville, Cleveland Electric Illuminating Company; W. P. Engel, Defiance Street Railway Company; Mrs. W. P. Engel; H. W. Hart, Cleveland Electric Illuminating Company; S. Cottingham, Deshler Light and Power Company; S. F. Messer, Warren Water and Light Company; E. C. Lindsey, Ravenna Gas and Electric Light Company; Stanley C. Smith, Bedford Electric Light and Power Company; Mrs. Stanley E. Smith; F. C. Morrison, Licking Light and Power Company; E. L. Booth, Bellaire Light and Power Company; Mrs. E. L. Booth; T. D. Buckwell, Toledo Railway and Light Company; Mrs. T. D. Buckwell; E. A. Geauque, Edgerton Electric Light System; J. S. Casebere, Edgerton Electric Light System; Howard Jones, Circleville Light and Power Company; F. A. Plymale, Gallipolis Gas and Coke Company; C. C. Custer, Miami Light, Heat and Power Company; R. G. Sloat, Sandusky Gas and Electric Company; Wm. Ruff, Sandusky Gas and Electric Company; Mrs. Wm. Ruff; Frank Espy, Tiffin Electric Company; Mrs. Frank Espy; Elam Fisher, Eaton Lighting Company; Mrs. Elam Fisher; O. H. Hutchings, Dayton Lighting Company; Mrs. O. H. Hutchings; Helen Hutchings; L. A. Pearson, Stillwater Valley Electric Plant; C. B. Cokefair, Eaton Lighting Company; Mrs. C. B. Cokefair; E. J. McCutcheon, Citizens Light and Electric Company; D. Friedenberg, Citizens Light and Electric Co.; W. R. Griffin, E. Liverpool Traction and Light Company; Mrs. W. R. Griffin; C. V. Hard, Wooster Electric Company; James O'Toole, Hamilton Electric Plant; C. M. Baxter, Northern Ohio Traction and Light Company; W. J. Brean, Citizens Gas and Electric Company; J. R. Row, Ottawa Electric Light Company; Mrs. J. R. Row; J. Freghner, Sebley Electric Company; F. C. Stanford, Bucyrus Light and Power Company; T. J. Smith, New Lexington Electric Light Company; Chas. H. Graves, Oak Harbor Electric Company; Mrs. Chas. H. Graves; A. N. Cope, Springfield Light, Heat and Power Company; C. T. Munz, Toledo Railway and Light Company; Mrs. C. T. Munz; Geo. W. Sloan, Port Clinton Light Company; C. W. Post, Delphis Electric Light and Power Company; H. A. Peffley, Bradner Water, Gas and Electric Light Plant; C. M. Lott, Hicksville Electric Light Company; C. A. Matthews, Port Clinton Electric Light and Power Company; N. B. Ervin, Gibsonburg Electric Light Company; A. B. Young, Kent Water and Light Company; I. B. Matthews, Toledo Railway and Light Company; J. T. Flynn, Bellaire Light and Power Company; George C. Mylander, Oak Harbor Electric Company; A. A. Pointer, Antwerp Electric Company.

MANUFACTURERS' REPRESENTATIVES.

Hubbard & Company, C. L. Pierce, Jr.; C. S. Davidson, Holophane Company; Wm. L. Dillon, Sanitary Pump Co.; F. K. Bybee, Erner & Hopkins Co.; George B. Edgar, W. V. Orr, A. A. Serva, T. E. Ryan, A. S. Ryan, Ft. Wayne Electric Works; Miss Rachel Edgar, W. D. Shaler, Elliott Reynolds, Doubleday-Hill Electric Company; Florence Eise, F. J. Gibbons, S. G. Hibben, Macbeth-Evans Glass Company; P. B. Postlthwaite, Wagner Electric Manufacturing Company; Norval N. Cobb, Lee Kirkpatrick, Enterprise Electric Company; H. G. Knoderer, Mrs. H. G. Knoderer; G. N. Mueller, Miss Ludwig, Nernst Lamp Company; R. J. Russell, Century Electric Company; Mrs. R. J. Russell; F. N. Godfrey, Bryan-Marsh Company; Mrs. F. N. Godfrey; W. E. Bischoff, W. N. Matthews & Brother; A. Schwartz, Bradford Belting Company; Edwin L. Van Winkle, Post-Glover Electric Company; I. E. Archer; Thomas B. Arnold, Mrs. Thos. B. Arnold; C. W. Sullivan, G. W. Sullivan & Company; H. M. Boyle, Sterling Electric Manufacturing Company; Anna Brennan; J. F. Donahue, Mrs. J. T. Donahue; Miss Rhea Donahue, W. F. Benedict, Mrs. W. F. Benedict, the Sterling Electrical Manufacturing Company; H. G. Ridgway, Crocker-Wheeler Company; C. W. Chappelle, Electric Storage Battery Company; C. W. Lee, C. W. Lee Company; E. J. Stroud, Johns-Manville Company of Texas; Paul Stewart, John A. Stewart Electric Co.; Dean Emerson, Wagner Electric Manufacturing Company; D. D. Gill, Triumph Electric Company; F. M. Knierim, A. O. Clingman, L. C. Crabbs, D. O. Vaughan, H. O. Smith, F. Bissell Company; H. O. Dutter, Hall Gas Engine Company; Mrs. H. O. Dutter; L. H. Keller, Union Electric Company; Robert L. Jaynes, American Conduit Manufacturing Company; Ralph B. Wilcox, Standard Underground Cable Company; Wm. R. Collins, New York & Ohio Company; H. H. Cudmore, Brilliant Electric Company; J. E. Swisher, Globe Electric Company; Mrs. J. E. Swisher; M. D. Phelps, Sterling Electrical Manufacturing Company; Mrs. M. D. Phelps; Miss Sherley Phelps; Thos. T. Richards, Wagner Electric Manufacturing Company; J. W. Brooks, John A. Roebling's Sons Company; S. B. Dewey, H. W. Johns-Manville Company; V. R. Despard, Pass & Seymour, Inc.; C. L. Bogen, Cleve. Electrical Supply Company; Mrs. C. L. Bogen; James Strasburg, W. A. Baker, American Electrical Heater Company; Mrs. E. J. Bechtel, F. J. Alderson, Mrs. P. J. Williams, Electric Appliance Company; W. C. Anderson, Canton Electric Company; Robert E. Lane; J. P. Arndt, W. J. Rose, Alliance; O.; H. A. Brereton, General Incandescent Lamp Co.; Chas. S. Kuntz, F. D. Lawrence Electric Company; P. J. Williams; F. R. Batchelder, Buckeye Engineering Co.; E. F. Gynn, Delaware, O.; Wm. H. Sinks, Columbia Meter Company; W. B. Hickox, Adams-Bagnall Electric Company; J. Mitchell, Adams-Bagnall Electric Company; Mrs. A. J. Mitchell; F. H. Krauss, Banner Electric Company; Bond Wisler, American Electrical Works; Lee Reynolds, Sprague Electric Company; C. S. Campbell, Erner & Hopkins Company; Mrs. E. J. Stroud; Mrs. Chas. E. Stroud; George Cutter, George Cutter Company; Mrs. George Cutter; M. L. Baker, Cleveland Electrical Supply Company; F. B. Allen, Cooper-Hewitt Electric Company; Chas. F. Gilliatt, Excess Indicator Co.; W. H. Underwood, Triumph Electric Company; Henry P. Thompson, Harrison Safety Boiler Works; George B. Dusinberre, American Electric Fuse Company; R. F. Laganke, Cleveland Electric Supply Company; Chas. L Eshleman, Jandus Electric Company; Roscoe B. Iddings, the Pyrene Company; F. N. Wilcox, Columbus, O.; Warner Jones, Cleveland Electric Supply Co.; A. Durbin, McConnellsville-Malta Electric Company; Ford S. Smith, Smith Chandelier Company; John F. Cook; N. A. Wolcott, Packard Electric Company; Mrs. N. A. Wolcott; John A. Stewart, John A. Stewart Electric Company; A. B. Walter, American Ship Building Company; W. Hill, R. Hall, Overland Automobile Company; Lee Brokaw, Federal Sign System; W. H. Pearl, Central Electric Company; Mrs. W. H. Pearl; Thos. F. Bechtel, Electrical Distributors Company; M. A. Watterson, Erner Electrical Company; A. B. C. Palmer, S. D. Eckler, B. J. Shockley, Fremont Yaryan Company; H. G. Boyers, Toledo Chandelier Manufacturing Company; C. E. Cromwell, Dayton Sanitary Pump Company; H. C. DeKamp, Frank F. Carter, A. E. Rickards, W. B. Wilkinson, Mrs. W. B. Wilkinson, E. H. Ott, H. H. Hughes, S. J. Folkman, George S. Vail, R. D. Nye, A. S. Butler, J. W. Schrangtz, F. O. Kirkpatrick, S. L. Blackburn, Harry G. Glass, R. W. Rabe, E. T. Seelig, A. E. Gregory, J. B. Linslay, George T. Glover, F. M. McAdams, J. R. Townsend, G. E. Miller, Westinghouse Electric and Manufacturing Company; Burton Stevenson, Westinghouse Machine Company; J. C. McQuiston, Mrs. J. C. McQuiston; W. Barnes, Jr., Westinghouse Bureau of Publicity; J. K. McDonough, I. M. Cassell, G. Lowe Guy, R. E. Russell, W. S. Culver, Mrs. W. S. Culver, H. C. Houck, C. H. Clark, G. H. Stickney, Mrs. G. H. Stickney, Fred T. Benson, George C. Osborn, J. A. Davies, F. E. Cofran, A. E. Alley, F. O. Fantt, W. J. Hanley, Oscar Carman, General Electric Company; A. G. Summerell, Mrs. A. G. Summerell, Marion Summerell, Ruth Summerell, F. H. McDowell, A. B. Pyke, N. C. Cotabish, National Carbon Company; Frank G. Boiles, C. L. Ratterman, F. C. Colwell, Mrs. F. C. Colwell, C. S. McGill, D. H. Kelly, C. P. Billings, Allis-Chalmers Company; A. Schwenck, L. T. Milnor, F M. Shely, D. W. Hopper, L. N. Vail, H. C. Owen, Western Electric Company; A. H. Winslow, Earl Williams, M. D. Cooper, National Electric Lamp Association; T. D. Thomas, V. M. Bates, V. C. Maxwell, Chas. J. Gillespie, H. H. Dennis, F. E. Dennis, F. H. Corwin, L. F. Carney, G. A. Brown, A. L. Carney, W. G. Nagel Electric Company; E. V. Hennecke, Faries Manufacturing Company.

Electric Club Picnic.

As announced last week in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, the Electric Club of Chicago will hold their second annual outing on Saturday, August 6, at Ravinia Park, on the line of the Chicago and Northwestern Railway. A special train of ten cars will leave the Wells Street Station at 10:15 a. m., stopping at Davis Street, Evanston, at 10:40. The return will begin at 5:30 p. m.

George H. Porter is chairman of the committee which has the affair in charge, and the following committees have been appointed on various details: R. M. Van Vleet, on finance; H. A. Mott and F. S. Hickok, on publicity; O. B. Duncan, F. T. Wilbur and W. R. Bonham, on ladies; F. W. McClement and W. S. Taussig, on athletics.

More than fifty prizes have been contributed for the various events, and these are stated by the committee to be the finest collection ever given out at any picnic. Every lady present will be presented with a souvenir parasol. There will be races and guessing contests, dancing, and a baseball game between the single men and the benedicts. A band will accompany the club on the train, and the New York Symphony Orchestra, under Walter Damrosch, will give a concert in the afternoon.

Another Step Towards Chicago Railways Merger.

Judge Grosscup, who was appointed umpire to determine the rights of the Cicero & Proviso Street Railway Company in the proposed merger of the lines of the Chicago Railways Company and the Consolidated Traction Company, has rendered his decision. He was assisted in determining the issue by Calvin Goodrich, president of the Twin City Rapid Transit Company, of Minneapolis, and George G. Moore, financial director of the Michigan United Railways. The finding is highly satisfactory to the bondholders of the road and removes the chief obstacle to the proposed merger. About the only things that remain are the securing of a city ordinance, which is being sought, and the Probate Court proceedings involving the interests of the Yerkes estate in the Consolidated.

Convention of Association of Railway Electrical Engineers.

The annual convention of the Association of Railway Electrical Engineers will be held in the La Salle Hotel, Chicago, September 27-30. The entire seventeenth floor of the hotel has been reserved for the convention. All of the exhibits will be located in the large ballroom, which affords ample accommodation and a beautiful setting for the convention exhibits.

All matters pertaining to the various applications of electricity in railway operation, aside from telegraphy and signaling, will be considered at this convention and it is anticipated that a large number of railroad men will be in attendance.

CENTRAL-STATION PRACTICE

Transmission—Interior Wiring.

RECENT IMPROVEMENTS IN DISTRIBUTING TRANSFORMERS AND THEIR RELATION TO METHODS OF DISTRIBUTION.

BY J. FRANK MARTIN.

The manufacturers of distributing transformers are to be congratulated on the high degree of efficiency reached in the present design of this apparatus. Reliability of operation, the most vital point of all, is present to a remarkably high degree, allowing little to be desired in this direction.

However, an intelligent decision as to what is the best transformer and method of distribution for his use, is by no means easily arrived at by the central-station engineer. The effect of recent improvements, so far as he is concerned, has been to reduce the losses materially, and particular stress is being given to the possible improvement in the operating characteristics by the manufacturers. A considerable increase in economy is to be had by the result of the change in losses on the operating condition of prime movers, generators and the distributing system; that is, the designs are such that the losses and their relation to the cost of the transformer can be varied to meet varying load conditions and fuel costs.

Granting this to be true, it is of the most importance for the operating engineer to confine his efforts for improvement to the operating efficiency, which is to a large degree independent of the cost of energy at the transformer. The all-day efficiency as affected by variable conditions on the load side of the transformer can be greatly improved.

Analysis of statistics of the average central station employing alternating-current distribution shows a considerable margin between the rated capacity of generating units or station transformers and the total distributing transformer capacity. Cases are common where the excess in capacity for distributing transformers reaches one hundred per cent. This condition is due directly to the difficulties met in eliminating or controlling the variable load conditions at the point of delivering service, and brings about a situation where the most efficient piece of central-station apparatus is operated with the most uneconomical results.

These conditions in the regular order of each are:

1. The Demand Factor, or ratio of maximum demand to rated capacity, is low and has a wide variation.

2. The Diversity Factor, or ratio of the maximum simultaneous demand to the sum of maximum individual demand, has a wide variation.

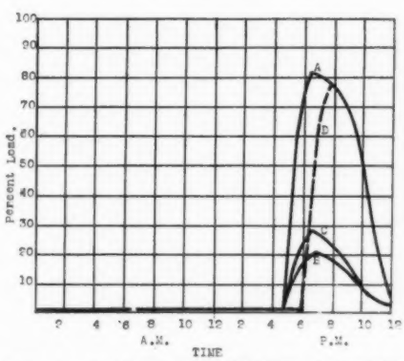


FIG. 1.—LOAD PERFORMANCE OF RESIDENCE LIGHTING INSTALLATIONS.

3. The Load Factor, or ratio of average input to maximum demand taken for short periods, has a wide variation and is generally low.

The effect of these factors can be best illustrated by applying them to a typical case of current distribution for residence lighting. Assuming that there are one hundred installations or consumers and taking one hundred per cent as the average rated or connected load of each, the performance over periods of twenty-four hours would be as shown in Fig. 1. Curve A indicates the highest point reached by the maximum demand on any individual element of the group, which has a wide variation and occurs very infrequently. B is the highest value reached by the normal demand, which is practically constant from day to day, while C is the normal value of the maximum demand, assuming the characteristic of the whole group considered as a single element. The broken curve D and its bisections with the other curves shows the variation of the load period with the change in length of the day from season to season. These curves show that the diversity factor reaches a maximum value of twenty-six per cent and the load factor varies from fifteen to twenty-five per cent on the individual installation, while these values are constant and have no variation when the element is grouped. This difference is due principally to the environment of the individual consumer, which causes a variation in the diversity and demand factors to a certain extent proportional to the rated capacity of the installation, and in the last case, to the fact that these variations are not coincident when taken collectively. Therefore, grouping of service connections or centralizing the transformer capacity supplying these connections, follows the natural law which is recognized in the design of central stations; that is, concentration of prime movers and accessories under general conditions means conservation of the investment and more economical operating and maintenance expenses.

Comparing the two methods, individual and group service supply, we have effected other economy than that given by eliminating the diversity and demand factors and increasing the load factor at the transformer. This is due to the difference in the cost of the several sizes of distributing transformers and a similar variation in the losses per rated unit of capacity. These characteristics, which are due to manufacturing limitations, are shown in Figs. 2 and 3; the first showing the losses in a full line of transformers, the difference between the curves being a variation that is met in the product of several reputable manufacturers. Fig. 3 shows the variation in cost, the dif-

ference in the curves being a variation in the relative cost and efficiency ratings. These limitations apply to practically all electrical apparatus, but in this case have a pronounced value on account of the difficulties met in raising the all-day efficiency of the distributing transformer under general conditions. Employing individual transformer distribution the all-day efficiency averages twenty-five per cent, while it is possible to raise this value to eighty per cent by employing a large transformer advantageously placed, so as to supply a large number of consumers. The increase in operating efficiency is due to the large decrease in losses, while there is great economy in the investment.

Fig. 4 shows the ratio of the transformer capacity to the connected load under each of the load conditions illustrated by the curves in Fig. 1. A is the capacity required when serving a

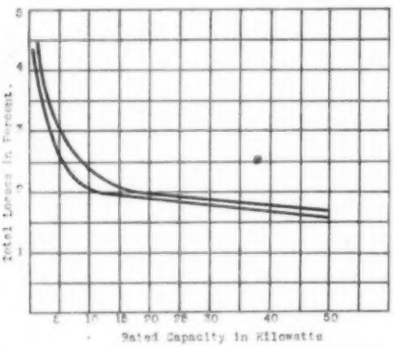


FIG. 2.—RELATIVE LOSSES OF DIFFERENT SIZES OF DISTRIBUTING TRANSFORMERS.

connection from an individual transformer, and B is that required for each connection when using a party transformer. Consulting the curves in Fig. 1, it is indicated that the load period on lighting installations is confined to five hours in the evening, with a peak of very short duration. Corresponding in load-time values the curves in Fig. 4 are plotted to show the mean value of the guaranteed overload temperature ratings of the transformer for the same period in hours. This is a departure from the general practice, as no consideration of the overload ratings is taken. Usually the transformer capacity is twenty per cent higher than shown here, and there is reason for this practice when employing individual transformer distribution on account of the presence of the variable load and demand factors of a high value, but it is desirable that this condition be taken advantage of when using a party transformer, since the load factor is constant and the diversity factor is eliminated.

On the other hand, the position may be taken that it is highly objectionable

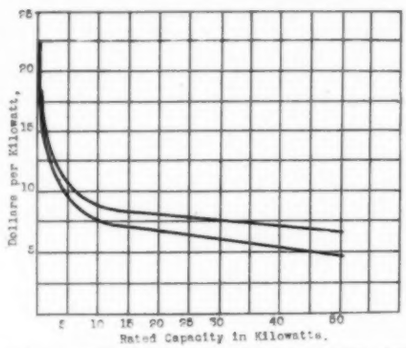


FIG. 3.—RELATIVE COST PER UNIT OF RATED CAPACITY FOR DIFFERENT SIZES OF DISTRIBUTING TRANSFORMERS.

to work transformers at an overload under these conditions on account of increasing the copper losses during the peak-load period. On a large distribution system this practice would require an increase in the prime mover capacity, but following the natural law applying to the centralization of this apparatus, it is most economical to make the investment in the power house; that is, the saving in distributing transformer capacity less increased maintenance on these transformers, will be greater than the required investment in prime movers.

Another condition which is given very little consideration is the relation of the load on a transformer to the

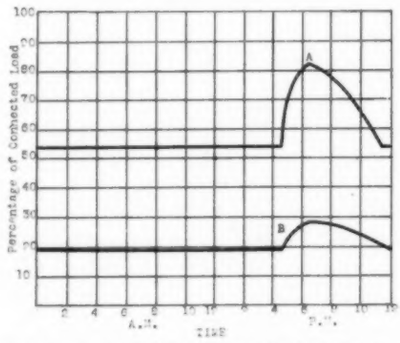


FIG. 4.—RELATION OF TRANSFORMER CAPACITY TO CONNECTED LOAD.

atmospheric temperature. In Fig. 5 the dotted lines A and B represent the mean atmospheric temperatures for summer and winter as taken by the United States Weather Bureau. Referring to Fig. 1 again, it is shown that the load period is shortest during the summer, the period of highest temperature; and is longest during winter, the time of lowest temperature. Taking the load conditions shown in Fig. 1 and transformer ratings as specified in Fig. 4, the copper-rise temperature of the transformer is indicated by the solid lines A_1 and B_1. As shown, these conditions also favor the practice of working the transformers at an overload, but are applicable to transformers installed outdoors only.

Summing up, the substitution of modern distributing transformers arranged for grouped-service supply as outlined above will reduce the investment fifty per cent, increase the all-day efficiency 350 per cent and reduce the maintenance seventy-five per cent. If the improvement in the readiness-to-serve factor, the reduction in liability to injury to the workmen and the public, and the improvement in continuity

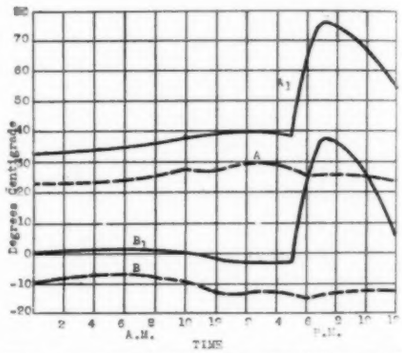


FIG. 5. — RELATION OF TRANSFORMER TEMPERATURE RISES TO ATMOSPHERIC TEMPERATURE.

of service could be capitalized, the comparison would be still more favorable to this method of distribution and the changes proposed.

The practice as outlined will apply to all classes of central-station service. Residence lighting, service for business houses, amusements and manufactories each have distinctive performance characteristics and limitations, and special conditions affecting individual cases will be met; but the principles set forth, when carefully worked out, will generally give an increase in economy.

Some English Power Rates.

The town of Eccles, England, has recently installed a new system of charging for electricity for motors and heating as follows: For the first fifty kilowatt-hours of maximum demand per quarter, six cents per kilowatt-hour; for all over, one and one-half cents.

Hydroelectrics in Japan.

A British consular official in Yokohama, Japan, sends the following abstract from a report on Japanese trade which will be published in the near future:

One of the features of 1909 was the activity with regard to waterpower schemes. There is no doubt that a country like Japan, with a large number of rivers and waterfalls, is ideally situated for the production of waterpower, and there are already in many parts of the country small plants in operation for the running of electric light and street-railway undertakings. Of large hydroelectric undertakings, however, the only one which appears to be meeting with success is that of the Uji River, which is intended to supply Osaka. The other great consumer of power in Japan is the capital, Tokio, and there are five or more waterpower schemes on foot, all of which have been placed with a view to enabling Tokio to dispense with coal. Two of these enterprises have been jointly undertaken by British and Japanese capitalists, but various difficulties have arisen, sometimes on one side and sometimes on the other, and it does not appear that either scheme is making very rapid progress. There are said to be many obstacles in the way of the larger projects. In one case the dam to be constructed would have to be of such big dimensions that some experts doubt whether it would be safe in an earthquake country; in another case the flow of water cannot be depended upon; while in yet another the water, coming as it does from a district which is full of mineral springs, would probably corrode the pipes and injure the machinery. No doubt similar or even more serious difficulties have to be encountered by engineers in other parts of the world, and if all the troubles in connection with the financing of the scheme and the rights of farmers, etc., can be overcome, the suppliers of cheap power to Tokio will have a chance of making excellent profits.

Water Power in Bavaria.

It is interesting to note, says a German correspondent of the London (England) *Electrical Engineer*, that the utilization of water power for electrical purposes has made such strides in Germany that the Bavarian Government has created a special department, presided over by Herr Stengler, to investigate the water resources for power production in the country, to make proposals for the utilization of those resources by the State, to examine applications for concessions emanating from municipalities and private firms, and to act as an information bureau for all wanting to employ water power for electrical purposes. The new department will co-operate with the hydrotechnical already existing under Ministerialrat Hensel, who has already accumulated many important statistics as to amount of water obtainable from various rivers and streams at different times of the year. Both departments are under the Minister of the Interior, or as he would be called in England, the Home Secretary. Some of the results of the joint labors of the combined offices may now be given. It is estimated that in Bavaria, for at least seven months in the year, 560,000 horsepower can be obtained south of the Danube, and 9,000 more north of it. The cost of utilizing this power up to the point of driving the turbines is put at a price for installation not exceeding 1,000 marks per horsepower. The worst of it is that nearly all the water power is in the south of Bavaria, while most of the Bavarian industries are carried on in the north. The establishment of new factories, except pulp and nitrogen factories, is made difficult in Southern Bavaria by heavy freight rates. Nevertheless, that is not an insuperable difficulty, but a drawback merely. The increase of our knowledge of cheap transmission of electrical power to a distance from the source of energy is now so complete that there is no reason why as much as may be wanted of the 560,000 horsepower should not be transmitted across the Danube, and arrive at where it is wanted at such a small cost above what would be incurred if the water power was available on the spot that the extra expenditure would have little or no influence on the selling price of the manufactured goods.

As regards concessions it has been agreed that they shall be granted irrevocably for forty years, and then revocably for a further time of thirty years. A moderate annual fee will be charged, and at the expiration of the concession no compensation will be payable by the State. At the same time the concessionaire will be bound to sell the electric energy at a reasonable rate for all purposes of public utility.

Minimum Service Charge for Electricity.

The Albany (N. Y.) Municipal Gas Company has served notice on its consumers of electricity for lighting purposes that beginning July 1 a "minimum service charge of $1 per month will be made on all installations." The rule, says the *Municipal Journal and Engineer*, has raised the question of whether or not this charge is a violation of the law of 1907, which restricts the company to a charge of not more than ten cents per kilowatt-hour. The new ruling will affect many consumers, especially those who leave the city during the summer. If no current is used at all by customers the charge will be $1 a month. The effect in many instances will be to make the charge more than the maximum allowed by the law if it be construed as a charge for electric current. The law places a penalty of $1,000 for each overcharge. It is probable the Public Service Commission will be called upon for a ruling on the question involved. In other cities of the state the commission has not regarded a service charge as unreasonable, but on account of the special law in reference to Albany a legal construction as to power to make a service charge will be necessary.

New Hydroelectric Plant in Germany.

A British correspondent states that the Baden Diet is considering a supplementary estimate for preliminary work in connection with the establishment of a hydroelectric station in the Murg Valley above Forbach. The current will be used by the State Railway administration for lighting purposes for power at the railway workshops, and for the state harbor at Mannheim. The cost of the generating and transmission plant will be in the neighborhood of $6,500,000.

Proposed Smoke-Abatement Ordinance.

At the annual convention of the International Association for the Prevention of Smoke, recently held in Minneapolis, Minn., action was taken to have a uniform smoke-abatement ordinance drawn and adopted by the Association, with the idea of persuading all cities to adopt the same measure. Central-station service was also advocated.

ELECTRIC LIGHTING and ILLUMINATING ENGINEERING

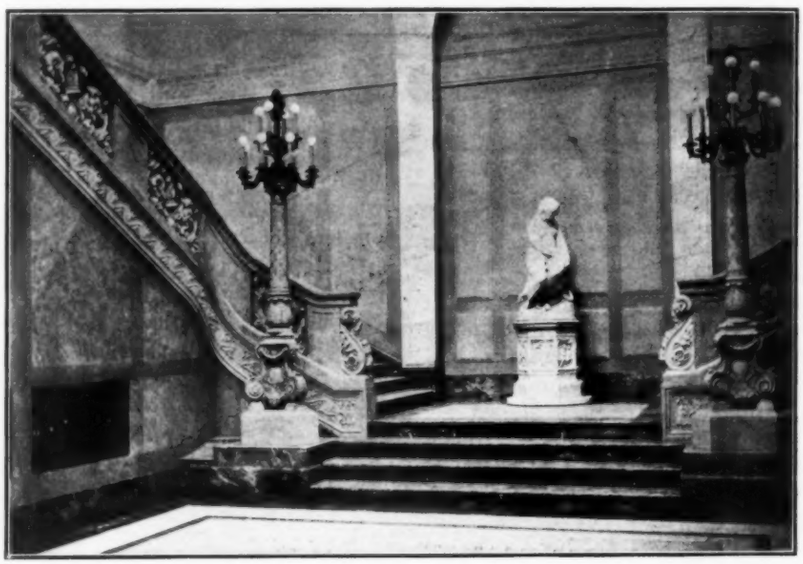
THE MORGAN MEMORIAL BUILDING AT HARTFORD.

A WELL-DESIGNED ELECTRIC LIGHTING INSTALLATION.

The Wadsworth Athenæum at Hartford has served for many years as a center of historical, literary and artistic interest, both in the city of Hartford and throughout the state of Connecticut. Within its walls are contained many valuable collections of historical records and relics, paintings and other works of art, rare books and natural history specimens. In addition there is a well-patronized circulating and research library and an art school, the latter being housed in a small building, in the rear of the Athenæum, known as the Annex.

During the past three years important additions have been under construction. These have just been completed. They consist of the Morgan Memorial Building, presented by J. Pierpont Morgan, covering an area of about 7,000 square feet, and the Colt Addition, which is the gift of the Colt estate, covering an area of some 2,000 square feet. This latter forms a connecting link between the Morgan Memorial Building and the Athenæum Building. These two new buildings, together with the Athenæum itself, have a combined frontage of about 260 feet on Main Street and 170 feet on Athenæum Street, and it is planned to extend the Morgan Memorial Building back to Prospect Street on the rear in such manner as to form a great quadrangle, which will enclose in a spacious court the unfinished or unsightly wall surfaces of some of the existing buildings. The new structure will include a large gallery for sculpture practically three stories in height and a reproduction, but in somewhat simpler form, of the western pavilion which has just been completed. The new eastern pavilion will be devoted to rooms adapted to educational and administrative purposes, and arranged to be capable of communication with future extensions of the Athenæum itself.

The design of the electrical equipment for the buildings just completed involved principally the supplying of motors for driving the ventilating fans and ash elevator, distribution wiring and the problems of illumination. The special lighting features introduced problems of great interest and importance and required most careful consideration.



MAIN STAIRWAY, MORGAN MEMORIAL BUILDING.

Electrical energy is obtained from the underground mains of the Hartford Electric Light Company in Main Street. This company supplies the new buildings with alternating current on the three-wire 110-220-volt system for lighting, and direct current at 220 volts for power purposes.

The alternating-current and direct-current service feeders for the building are run in from the manholes in Main Street, under the lawn, in separate lines of vitrified-tile ducts. These enter the basement of the building just above the floor level near the north end of the corridor in the Colt Wing, and are continued up the wall in iron-pipe conduit to a pair of main cut-outs and service switches mounted in a steel cabinet.

The direct-current service feeders consist of two No. 0 rubber-insulated, lead-covered cables. The alternating-current service feeders consist of two No. 0000 rubber-insulated, lead-covered cables and one No. 0 bare cable, the latter serving as the neutral wire.

From the service cut-outs the supply mains are continued in separate lines of iron-pipe conduit, run on the ceiling through the old building to the fan-room of the heating and ventilating plant, located just back of the Colt Wing in the court formed between the Morgan Building and the Wadsworth Athenæum.

The switchboard is located in the fan-room. It consists of three black enameled slate panels mounted upon an angle-iron framework in the usual manner, there being a main switch and meter panel in the center with a direct-current, two-wire power-feeder panel on the left and an alternating-current, three-wire lighting-feeder panel on the right. These feeder panels are provided with a sufficient number of spare switches to take care of such future

extensions of the building as are now contemplated. The center panel carries the main power switch and power meter and the main lighting switch and lighting meter.

From the power-feeder panel four circuits have been run, all in rigid iron-pipe conduit. These carry current to the ventilating fan motors, of which there are two, to the motor which drives the ash elevator and to a motor outlet in the janitor's room equipped with a knife switch placed in a cast-iron service-type switch box, from which wires may be run, as required, to a small motor or other device located in this room.

From the lighting feeder panel of the switchboard separate feeders are run to distribution panel boards in the basement, first and second stories, from which panels all branch circuits are run. All of this wire is run in rigid pipe conduit. All conduit is concealed in the walls or floors, except in the boiler and fan rooms, where it is exposed throughout.

INDIRECT LIGHTING IN NORTH GALLERY.

The panels and their cabinets are of standard construction, the former being three to two-wire type, except that on the second floor, which has three-wire branches, with black enameled slate slabs, while the latter are of enameled steel with steel trim and doors. From the basement and first-floor panels the wires are run directly to the light outlets and all the direct lighting of the building is fed from these two panels.

From the second-floor panel submains are run to special rotary switches, there being two of these in each of the four galleries and in the main stair hall on the second floor, from each of which two three-wire mains are run to a secondary panel board in the skylight space over each of the galleries. From these secondary panels wires are run in exposed conduit to supply the lamps of the indirect lighting of the main stair hall and galleries.

In the lighting throughout the new buildings tungsten lamps have been used wherever possible, both for reasons of economy and also because of the whiter light given by these lamps as compared with carbon-filament lamps. This latter consideration is an important one where the objects to be lighted artificially are of a nature which requires that a close approximation to daylight be obtained. Most of the rooms and even the halls will contain exhibits of various kinds requiring special lighting, and each of these had to be taken up individually and the lighting so planned as to meet its needs in the best possible manner.

The main entrance hall is lighted entirely by means of wall-bracket fixtures, thus preserving an uninterrupted vista from the entrance, through the entrance hall into the stair hall beyond.

The stair hall is lighted by means of forty tungsten lamps suspended above the skylight of the stair-hall ceiling. These lamps are supported from a special fixture designed for the purpose and made up of conduit and condulets. The fixture is hung from the ceiling beams in such manner as to bring the lamps sufficiently close to the glass for good lighting without producing an objectionable spotting of the lower glass. Each lamp is equipped with a reflector designed to direct the light in the desired way.

This indirect lighting of the stair hall is supplemented by two ornamental candelabra, one on each side at the foot of the stairs and each equipped with twelve sixteen-candlepower lamps and by two wall receptacles opposite the head of the stairs, which may be used for connecting portable candelabra or other special lighting arrangements as may be needed from time to time to fill some special requirement for lighting.

In the Colt Room and Reception Room, both of which contain wall cases which cover about all the available wall space, the lighting is accomplished by means of central chandeliers, supplemented in the Colt Room by two wall receptacles for special lighting, and in the Reception Room by specially arranged case lighting.

The Natural History Room, which contains a considerable number of wall and center cases, is lighted by means of ten pendent fixtures, each consisting of a twelve-inch ground-glass ball suspended by a chain and containing a sixty-watt tungsten lamp. This is supplemented by lights within the wall cases, but the center cases, being directly under these ceiling fixtures, are not equipped with lamps.

The strictly utility lighting of the basement and portions of the first and second floors is accomplished principally by means of tungsten lamps equipped with Holophane shades or reflectors of types selected with reference to their fitness for accomplishing the desired results. This lighting is supplemented to some extent in less important portions of the building by sixteen-candlepower carbon-filament lamps. The Holophane shades most used are the high-efficiency bowl-type pagoda reflectors and the ceiling bowl-types or hemispheres, each containing a concentrating type of pagoda reflector placed within the collar of the fixture and above the lamp. A single lamp placed in a vertical pendent position is used in all of these fixtures.

The four picture galleries of the second floor presented the most important, and at the same time the most difficult, problem for solution. The result, however, fully justifies the time which was

devoted to the study and working out of this problem. While the design of the gallery ceilings is such as to immediately suggest the use of cove lighting for these rooms, a careful consideration of the requirements led to the conclusion that this form of lighting would not prove the best.

Cove lighting undoubtedly has many advantages, but it also has some serious defects, some of which are general and some applying only to special conditions, and these defects were considered to be vital in this instance. One strong objection to cove lighting is the unnatural condition of a brightly lighted ceiling which it produces, and also its destruction of perspective caused by the obliteration of shadows, all of which results in a condition unsatisfactory both from an architectural and an esthetic standpoint. Also, the unnatural and unusual condition of a ceiling cove much more brightly lighted than other parts of the room distracts the attention from more important objects and, both by comparison and by the physical effect upon the pupil of the eye, produces a sensation of dimness on the walls below the cove. On the other hand, cove lighting practically necessitates the placing of the lamps with the long axis horizontal, and the larger sizes of tungster lamps are not well adapted to operation in this position, on account of the ductility of the filament when hot, and its brittleness when cold.

Moreover, one very important consideration in connection with the artificial lighting of paintings is that of the color of the light. For good results this color should approach diffused daylight as closely as possible. The nearest approach to this condition which is commercially obtainable with any single type of illuminant is given by the tungsten lamp. The carbon lamp gives a light much too strong in the yellow and red rays, and is, therefore, not suited to best results.

The older and more commonly used method of artificially lighting pictures by means of long trough light reflectors containing the lamps and suspended from the ceiling, above the pictures and a few feet away from the wall, has most of the defects of the cove-light method, some to an even greater degree, besides many important defects peculiar to this form of lighting. Lighting by this method is far from uniform; the observer is continually disturbed by the glare of direct reflection from the surface of the pictures; and about its only advantages are cheapness of installation and comparatively lower cost of operation.

All of these considerations led to the selection of an indirect system of lighting for each of these galleries, as well as that in the main stair hall. In the ceiling of each of these rooms is a large rectangular skylight through which the daylight is admitted, there being no windows of any kind in these rooms. Over these skylights the roof proper is run up in the form of a large monitor with solid roof and glazed sides. A roomy space is thus provided between the gallery skylights and the roof. In this space the lamps are suspended from special fixtures in the manner already described in connection with the lighting of the main stair hall. These lamps have been so arranged and so equipped with special reflectors as to concentrate the main portion of the light upon the walls, but at the same time, to give sufficient general diffusion of the light to produce a pleasing effect of brightness throughout the entire room.

In obtaining this result the glass of the skylight itself played an important part. This was a rough wire glass with sandblast finish and was selected for the purpose as the result of a series of tests conducted upon several samples of glass submitted by the manufacturers. It was found, by these tests, that the glass, while giving good diffusion and reducing the objectionable effect of bright spots under the lamps to a minimum, did not seriously distort the projection of the light as produced by the reflector selected.

The result of the carrying out of this scheme of lighting is very pleasing. The walls are very well and very evenly lighted, and the quality of the light is so close an approximation to daylight that the transition from natural to artificial lighting of these rooms is scarcely perceptible. Moreover, the architectural effects of the galleries are preserved absolutely, and necessarily so, inasmuch as the direction and quality of the light entering the room and illuminating its interior is practically identical whether its source be natural or artificial. The accompanying illustration of one of the galleries is from a photograph taken by the indirect electric lighting, no flash lights being used whatever.

The successful outcome of the lighting of these buildings is due to the combined efforts of Benjamin W. Morris, the architect of the building, and of Putnam A. Bates, consulting engineer, who designed the complete electrical distribution system of these buildings and also the heating and ventilating equipments.

Argentine Electrical Illumination.

While Buenos Aires normally is the sixth city in the world in the number of electric lights, it was the second during the latter part of May in the Argentine Centenary celebrations, states Consul-General R. M. Bartleman.

The regular lighting power of 23,000 kilowatts was increased to 33,000, the increase being supplied by the Compania Transatlantica Alemana de Electricidad, an important German corporation; 200,000 lights of ten candlepower each and 400,000 of sixteen candlepower were installed in the streets and squares, the Plaza de Mayo, where the country's independence was declared, and the new Parque del Centenario being particularly brilliantly illuminated; 40,000 lights of sixteen candlepower each lighted the port and docks for the Venetian festival on the evening of May 28, when the United States steamship *Chester* and the other foreign men-of-war were lit up, making a brilliant effect; 90,000 lights of sixteen candlepower each were placed in the grounds of the five Centenary Expositions, where several of the illuminating displays used apparatus from the United States. The cost for the special ten days' illumination represented, approximately, $5,000 in United States currency per hour for the entire system. Practically all the lamps and accessories used in lighting the streets, squares and docks came from the United States, the remainder of the material being supplied by Germany.

Ornamental Lighting for Omaha.

Plans have been outlined to make the city of Omaha, Neb., one of the best illuminated in the country. A special committee has been appointed to confer with the local electric light company with regard to the immediate installation of the most ornamental standard made on a section of Sixteenth Street four blocks long. W. D. Williams, G. W. Craig and J. L. Kennedy constitute the committee.

TELEGRAPHY—TELEPHONY, and WIRELESS.

To Equip Lightships with Wireless.

The United States Lighthouse Board recently furnished a statement of the number of wireless apparatus that would be required for installation upon vessels belonging to the lighthouse establishment. Only such vessels as go out of sight of land are to be so equipped.

There are at present about twenty lighthouse tenders which go out of sight of land and upon which a wireless apparatus could be installed. Besides this number there are ten other lighthouse tenders which may possibly go out of sight of land occasionally. At the present time none of these tenders is equipped with wireless apparatus, but steps are now being taken to install a plant of this character upon the tender Kukui, which does service in Hawaiian waters. Wireless equipment is already in use on four lightships.

Six lightships which are stationed thirteen miles or more from the nearest land are not provided with wireless equipment and such apparatus might be installed upon these vessels.

It is estimated that the cost of installing wireless telegraph apparatus on vessels of the lighthouse establishment would aggregate $3,500 for each vessel to be so equipped.

The Automatic Enunciator.

New uses are constantly being discovered for the telephone. The latest, according to *Telephony*, is a device known as an automatic enunciator, and is particularly intended for use in large hotels for paging guests and making announcements. No longer will it be necessary to have boys going through all parts of a hotel calling out a person's name. The paging will be done by one person, and the call made in the various parts of the building at one and the same time so that the person will be notified immediately after the call has been requested. The enunciator is also intended for use on street cars in calling off the various streets; also by railroads for announcing the departure of trains in the stations, while on the trains it can be used for announcing stations, meals and giving news bulletins.

This enunciator is comprised of a special transmitter and a loud-speaking receiver or reproducer which are entirely different from any loud-speaking instruments now on the market. The transmitter is so constructed that the sibilant tones, such as found in U, S, R. Z, and other sounds, are distinctly reproduced at the other end of the circuit.

The transmitting apparatus is contained in the ordinary desk stand and may be connected to telephone wires for transmission of announcements, such as baseball games, over considerable distances to halls and other places. The receiving or reproducing apparatus is contained in a small case approximately three by three by six inches, which is equipped with an ordinary phonograph horn. The size of the horn varies, depending upon the size of the room or hall and the number of reproducers in it. The reproducers are all connected in multiple and a number of them may be located in a room or hall. The sounds from one reproducer do not interfere with the sounds from another as the instruments are all in synchronism and the sound appears to come from the instrument which is nearest the listener. Each transmitter is capable of energizing up to forty reproducers so that the reproducers scattered in various parts of a hall permit people, no matter where seated, to hear the announcements distinctly.

By the aid of repeaters the efficiency of one transmitter can be greatly increased, as one repeater will energize twenty reproducers and 100 repeaters can be used on the circuit with a single transmitter. The repeater, in addition to increasing the efficiency as regards the number of reproducers energized, also intensifies the sounds so that announcements can be sent long distances.

A test has been made using a transmitter connected direct to three reproducers in a hall seating 7,000 people and the results obtained were very satisfactory. A message has also been sent over a loaded line equivalent to 900 miles through a repeater and then into the reproducer with success.

Several of the leading Chicago hotels are about to install the system to be used for paging guests and making announcements.

The enunciator is the result of several years' work which has been directed and encouraged by Joseph Harris, whose perseverance and tenacity of purpose has had so much to do with the introduction of the automatic telephone in Chicago.

Army Wireless Outfits.

An American consular officer in a European country reports that an army official has addressed himself to a local firm requesting that he be furnished with wireless telegraphic outfits for distances of twenty to fifty miles. The report states that it would seem advisable for American manufacturers to investigate the opportunities presented in the country in question to dispose of wireless outfits. Particulars may be obtained by writing to the Bureau of Manufactures, Washington, D. C., quoting File No. 5276.

Telephone Supplies Wanted in Mexico.

A report from an American consul in Mexico states that the local telephone company is changing hands and the new company, represented by an individual whose name is given, will need quite a lot of new fixtures, as it has secured a concession to connect all the principal places throughout the state. Particulars may be obtained by writing to the Bureau of Manufacturers, Washington, D. C., quoting File No. 5278.

The History of the Telephone.

The Telephone in Foreign Countries—I.

BY HERBERT N. CASSON.

The telephone was nearly a year old before Europe was aware of its existence. It received no public notice of any kind whatever until March 3, 1877, when the London *Athenaeum* mentioned it in a few careful sentences. It was given no welcome, except by those who wished an evening's entertainment. And to the entire commercial world it was for four or five years a sort of scientific billiken, that could never be of any service to serious people.

One after another, several American enthusiasts rushed post haste to Europe, with dreams of eager nations clamoring for telephone systems; and one after another they failed. Frederick A. Gower was the first of these. He was an adventurous chevalier of business, who gave up an agent's contract in return for a right to become a roving propagandist. Later he met Nordica, fell in love and married her, forsook telephony for ballooning, and lost his life in attempting to fly across the English Channel.

ENOS M. BARTON.

Next went William H. Reynolds, of Providence, who had bought five-eighths of the British patent for $5,000, and half the right to Russia, Spain, Portugal and Italy for $2,500. How he was received may be seen from a letter of his which has been preserved. "I have been working in London for four months," he writes; "I have been to the Bank of England and elsewhere; and I have not found one man who will put one shilling into the telephone."

Bell himself hurried to England and Scotland on his wedding tour in 1878, with great expectations of having his invention appreciated in his native land. But from a business point of view, his mission was a total failure. He received dinners a-plenty, but no contracts; and came back to the United States an impoverished and disheartened man. Then the optimistic Gardiner G. Hubbard, Bell's father-in-law, threw himself against the European inertia and organized the International and Oriental Telephone Companies, which came to nothing of any importance. In the same year even Enos M. Barton, the sagacious founder of the Western Electric, went to France and England to establish an export trade in telephones, and failed.

These able men found their plans thwarted by the indifference of the public, and often by open hostility. "The telephone is little better than a toy," said the *Saturday Review;* "it amazes ignorant people for a moment, but it is inferior to the well-established system of air-tubes." "What will become of the privacy of life?" asked another London editor. "What will become of the sanctity of the domestic hearth?" Writers vied with each other in inventing methods of pooh-poohing Bell and his invention. "It is ridiculously simple," said one. "It is only an electrical speaking-tube," said another. "It is a complicated form of speaking-trumpet," said a third. No British editor could at first conceive of any use for the telephone, except for divers and coal miners. The price, too, created a general outcry. A flood of toy telephones were being sold on the streets at a shilling apiece; and although the Government was charging $60 a year for the use of its printing-telegraphs, people protested loudly against paying half as much for telephones.

The first man of consequence who befriended the telephone was Lord Kelvin, then an untitled young scientist. He had seen the original telephones at the Centennial in Philadelphia, and was so fascinated with them that the impulsive Bell had thrust them into his hands as a gift. At the next meeting of the British Association for the Advancement of Science, Lord Kelvin exhibited these. He did more. He became the champion of the telephone. He staked his reputation upon it. He told the story of the tests made at the Centennial and assured the skeptical scientists that he had not been deceived. "All this my own ears heard," he said, "spoken to me with unmistakable distinctness by this circular disk of iron."

The scientists and electrical experts were, for the most part, split up into two camps. Some of them said the telephone was impossible, while others said that "nothing could be simpler." Almost all were agreed that what Bell had done was a humorous trifle. But Lord Kelvin persisted. He hammered the truth home that the telephone was "one of the most interesting inventions that has ever been made in the history of science." He gave a demonstration with one end of the wire in a Wigan coal mine. He stood side by side with Bell at a public meeting in Glasgow, and declared that "the things that were called telephones before Bell were as different from Bell's telephone as a series of hand-claps are different from the human voice. They were in fact electrical claps, while Bell conceived the idea—*the wholly original and novel idea*—of giving continuity to the shocks, so as to perfectly reproduce the human voice."

One by one the scientists were forced to take the telephone seriously. At one public test there was one noted professor who still stood in the ranks of the doubters. He was asked to send a message. He went to the instrument with a grin of incredulity, and thinking the whole exhibition a joke, shouted in the mouthpiece, "Hi diddle diddle—follow up that." Then he listened for an answer. The look on his face changed to one of the utmost amazement. "It says—the cat and the fiddle," he gasped, and forthwith became a convert to telephony. By such tests the men of science were won over, and by the middle of 1877 Bell received a "vociferous welcome" when he addressed them at their annual convention at Plymouth.

Soon afterwards the London *Times* surrendered. It whirled right about face and praised the telephone to the skies. "Suddenly and quietly the whole human race is brought within speaking and hearing distance," it exclaimed; "scarcely anything was more desired and more impossible." The

next paper to quit the mob of scoffers was the *Tatler*, which said in an editorial peroration: "We cannot but feel impressed by the picture of a human child commanding the subtlest and strongest force in Nature to carry, like a slave, some whisper around the world."

Closely after the scientists and the editors came the nobility. The Earl of Caithness led the way. He declared in public that "the telephone is the most extraordinary thing I ever saw in my life." And one wintry morning in 1878 Queen Victoria drove to the house of Sir Thomas Biddulph, in London, and for an hour talked and listened by telephone to Kate Field, who sat in a Downing Street office. Miss Field sang "Kathleen Mavourneen," and the Queen thanked her by telephone, saying she was "immensely pleased." She congratulated Bell himself, who was present, and asked if she might be permitted to buy the two telephones; whereupon Bell presented her with a pair done in ivory.

This incident, as may be imagined, did much to establish the reputation of telephony in Great Britain. A wire was at once strung to Windsor Castle. Others were ordered by the *Daily News*, the Persian Ambassador, and five or six lords and baronets. Then came an order which raised the hopes of the telephone men to the highest heaven, from the banking house of J. S. Morgan & Company. It was the first recognition from the "seats of the mighty" in the business and financial world. A tiny exchange, with ten wires, was promptly started in London; and on April 24, 1879, Theodore N. Vail, the young manager of the Bell company, sent an order to the factory in Boston, "Please make 100 hand telephones for export as early as possible." The foreign trade had begun.

Then—there came a thunderbolt out of a blue sky, a wholly unforeseen disaster. Just as a few energetic little companies were sprouting up, the Postmaster General suddenly proclaimed that the telephone was a species of telegraph. According to a British law the telegraph was required to be a Government monopoly. This law had been passed six years before the telephone was born, but no matter. The telephone men protested and argued. Tyndall and Lord Kelvin warned the Government that it was making an indefensible mistake. But nothing could be done. Just as the first railways had been called toll-roads, so the telephone was solemnly declared to be a telegraph. Also, to add to the absurd humor of the situation, Judge Stephen, of the High Court of Justice, spoke the final word that compelled the telephone legally to be a telegraph, and sustained his opinion by a quotation from Webster's Dictionary, which was published twenty years before the telephone was invented.

Having captured this new rival, what next? The Postmaster General did not know. He had, of course, no experience in telephony, and neither had any of his officials in the telegraph department. There was no book and no college to instruct him. His telegraph was then, as it is today, a business failure. It was not earning its keep. Therefore, he did not dare to shoulder the risk of constructing a second system of wires, and at last consented to give licenses to private companies.

But the muddle continued. In order to compel competition, according to the academic theories of the day, licenses were given to thirteen private companies. As might have been expected, the ablest company quickly swallowed the other twelve. If it had been let alone, this company might have given good service, but it was hobbled and fenced in by jealous regulations. It was compelled to pay one-tenth of its gross earnings to the Post Office. It was to hold itself ready to sell out at six months' notice. And as soon as it had strung a long-distance system of wires, the Postmaster General pounced down upon it and took it away.

Then, in 1900, the Post Office tossed aside all obligations to the licensed company, and threw open the door to a free-for-all competition. It undertook to start a second system in London, and in two years discovered its blunder and proposed to co-operate. It granted licenses to five cities that demanded municipal ownership. These cities set out bravely, with loud beating of drums, plunged from one mishap to another, and finally quit. Even Glasgow, the premier city of municipal ownership, met its Waterloo in the telephone. It spent $1,800,000 on a plant that was obsolete when it was new, ran it for a time at a loss, and then sold it to the Post Office in 1906 for $1,525,000.

So, from first to last, the story of the telephone in Great Britain has been a "Comedy of Errors." There are now, in the two islands, not 600,000 telephones in use. London, with its 640 square miles of houses, has one-quarter of these, and is gaining at the rate of 10,000 a year. No large improvements are under way, as the Post Office has given notice that it will take over and operate all private companies on New Year's Day, 1912. The bureaucratic muddle, so it seems, is to continue indefinitely.

In Germany there has been the same burden of bureaucracy, but less backing and filling. There is a complete government monopoly. Whoever commits the crime of leasing telephone service to his neighbors may be sent to jail for six months. Here, too, the Postmaster General has been supreme. He has forced the telephone business into a postal mold. The man in a small city must pay as high a rate for a small service as the man in a large city pays for a large service. There is a fair degree of efficiency, but no high speed or record breaking. The German engineers have not kept in close touch with the progress of telephony in the United States. They have preferred to devise methods of their own, and so have created a miscellaneous assortment of systems—good, bad and indifferent. All told, there is probably an investment of $75,000,000 and a total of 900,000 telephones.

LORD KELVIN.

Telephony has always been in high favor with the Kaiser. It is his custom, when planning a hunting party, to have a special wire strung to the forest headquarters, so that he can converse every morning with his Cabinet. He has conferred degrees and honors by telephone. Even his former Chancellor, Von Buelow, received his title of Count in this informal way. But the first friend of the telephone in Germany was Bismarck. The old Unifier saw instantly its value in holding a nation together, and ordered a line between his palace in Berlin and his farm at Varzin, which lay 230 miles apart. This was as early as the fall of 1877, and was thus the first long-distance line in Europe.

In France, as in England, the Government seized upon the telephone business as soon as the pioneer work had been done by private citizens. In 1889 it practically confiscated the Paris system, and after nine years of litigation paid five million francs to its owners. With this reckless beginning, it floundered from bad to worse. It assembled the most complete assortment of other nation's mistakes, and invented several of its own. Almost every known evil of bureaucracy was developed. The system of rates was turned upside down; the flat rate, which can be profitably permitted in small cities only, was put in force in the large cities, and the message rate, which is applicable only to large cities, was put in force in small places. The girl operators were entangled in a maze of Civil Service rules. They were not allowed to marry without the permission of the Postmaster General; and on no account could they dare to marry a mayor, a policeman, a cashier or a foreigner, lest they betray the secrets of the switchboard.

There was no national plan, no standardization, no staff of inventors and improvers. Every user was required to buy his own telephone. As George Ade has said: "Anything attached to a wall is liable to be a telephone in Paris." And so, what with poor equipment and red tape, the French system became what it remains today—the most conspicuous example of what *not* to do in telephony.

There are barely as many telephones in the whole of France as ought normally to be in the city of Paris. There are not as many as are now in use in Chicago. The exasperated Parisians have protested. They have presented a petition with 32,000 names. They have even organized a "Kickers' League"—the only body of its kind in any country, to demand good service at a fair price. The daily loss, from bureaucratic telephony, has become enormous. "One blundering girl in a telephone exchange cost me five thousand dollars on the day of the panic in 1907," said George Kessler. But the Government clears a net profit of $3,000,000 a year from its telephone monopoly, and until 1910, when a committee of betterment was appointed, it showed no concern at the discomfort of the public.

There was one striking lesson in telephone efficiency which Paris received in 1908, when its main exchange was totally destroyed by fire. To build a new switchboard, said European manufacturers, will require four or five months. A hustling young Chicagoan appeared on the scene. "We'll put in a new switchboard in sixty days," he said; "and agree to forfeit $600 a day for delay." Such quick work had never been known. But it was Chicago's chance to show what she could do. Paris and Chicago are 4,500 miles apart—a twelve days' journey. The switchboard was to be 180 feet in length, with 10,000 wires. Yet the Western Electric Company finished it in three weeks. It was rushed on six freight cars to New York, loaded on the French steamer *La Provence*, and deposited at Paris in thirty-six days, so that by the time the sixty days had expired it was running full speed with a staff of ninety operators.

[EDITOR'S NOTE.—This is the fifth part of a series of telephone articles by Mr. Casson on the History of the Telephone. Chapter II of "The Telephone in Foreign Countries" will be followed by an article on "Litigation Over the Telephone," in two parts.]

Test of Submarine Telephone Cable with Pupin Coils.

A description of the new telephone cable connecting Dover and Calais was given in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for April 2. Some tests of this cable were made on July 15, in comparison with the old cable.

The new cable is loaded with Pupin coils, which are spaced one nautical mile apart. There are two pairs of conductors in each cable, and these were connected together at the French end, the tests being made from Dover, England, by speaking through the looped cable. The tests were made by adding lengths of artificial cable to the line until the limit of commercial conversation was reached. With the old cable twenty-five miles of test cable could be added, while with the new forty-two miles was permissible, a gain of seventeen miles. This means that conversation can be carried on at a place 450 miles from Dover with a space equally distant from Calais on the French side, if aerial land lines are used weighing 800 pounds to the mile.

Some of the observers noticed a very marked improvement in the clearness of speech with the new cable alone in circuit, as compared with the old.

The Telephone in Life-Saving Service.

In order that the United States life-saving station in Jackson Park, Chicago, may be kept perfectly informed of accidents, etc., connection has recently been made with the lines of the Chicago Telephone Company. This connection will enable the surfmen at the station to respond promptly to all calls made upon them, whether they be for the purpose of assisting persons and vessels in distress, for the rescue of drowning persons, for the resuscitation of the apparently drowned, for the recovery of a lost body or for assistance to distressed mariners. In many instances the loss of a few minutes in notifying the life-saving crew that their services are required may mean the death of a person in peril on the lake.

More Telephones for Santa Fe Road.

The Santa Fe Railroad has placed an order with the Western Electric Company for 600 selectors, said to be the largest number ever ordered. The selector is a device for ringing singly any one of the stations along the line connected with the dispatcher's office by telephone.

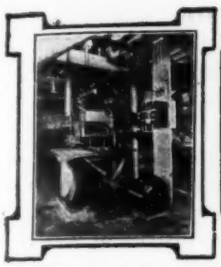
One of the first to take up dispatching by telephone, the Santa Fe now has the greatest mileage controlled by telephone. When construction now under way is completed, 7,000 miles of the company's lines will be so equipped.

Argentina-Europe Cable Opened.

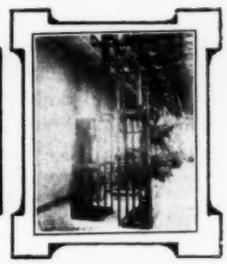
Consul-General R. M. Bartleman of Buenos Ayres reports that the direct cable of the Western Telegraph Company, via Asuncion, from Argentina to Europe, was opened June 3, being the first direct cable service from Argentina to Europe. At the same time the Central and South American Telegraph Company inaugurated material reductions in its cable tolls, reducing those to the United States by fifteen cents Argentine gold ($0.1447 United States currency) a word.

Bell Telephone Managers Confer.

A conference of the managers of the Rocky Mountain Bell Telephone Company, which operates in Utah, Idaho and Wyoming, was held recently at Salt Lake City, Utah. One of the features of the meeting was the organization of the Ninety Club, which is composed of managers who have made a record of ninety per cent or better in collections for their respective districts.



Industrial Power



An Electrically Operated Coal Mine.

One of the most notable examples of the adoption of electrical power for mining purposes in the North of England, says the London *Times*, is that lately completed at Harton Colliery, one of an important group in Durham County, owned by the Harton Coal Company (Limited), South Shields. The whole of the appliances at this colliery are now worked by electricity, no steam power being used for any purpose.

The most interesting feature of the new equipment is the substitution of an electrically driven winding engine for the steam-winding engine previously used. This engine is designed to deal with a maximum load of 240 long tons an hour, the particulars of the duty being as follows: Depth of wind, 1,302 feet; net load, eight tubs at one-half ton each, four tons; four deck cages and chains, five tons twelve hundredweight; time running in shaft, forty-eight seconds; changing, twelve seconds; maximum speed in shaft, 2,300 feet per minute. A flat galvanized steel balance rope is used, having a weight of four tons ten hundredweight, or about twenty-two hundredweight in excess of that of the winding rope hanging in the shaft. The total weight on the winding rope at the start is fourteen and one-half tons. The drum is cylindrical, fourteen feet in diameter and eight feet in width. The lagging is of oak six inches thick, with shallow grooves turned in it to accommodate the rope. The drum shaft is direct-coupled to the winding motor by a heavy forged-steel coupling, the combined shaft being carried by three pedestal bearings mounted on a common cast-iron bedplate. The brakes are of the post type, there being one brake path on each side of the drum and two posts per path. The brakes are operated by means of a compressed-air brake-cylinder and piston, and they can be given any pressure by varying the air pressure in this cylinder. They are applied by means of a hand lever under ordinary working conditions, but in case of emergency are brought automatically into action. Compressed air at sixty-five pounds per square inch is provided by means of a small compressor, driven by a twelve-horsepower motor, which is started and stopped automatically when the air pressure falls below sixty pounds or exceeds seventy pounds per square inch. In the event of the pressure becoming insufficient the brake cannot be released and the engine cannot start.

For driving the engine three-phase current at 5,500 volts, forty cycles, is supplied by the County of Durham Electrical Power Distribution Company (Limited) from the Carville Station by means of duplicate cables. The winding motor, manufactured and erected by Siemens Brothers Dynamo Works (Limited), is connected direct to the source of supply without interposition of transformers and has a speed of 54.5 revolutions per minute at synchronism, and of 52.5 revolutions per minute at full load. The diameter of the rotor is sixteen feet six inches, and its weight twenty-five tons; that of the whole motor, exclusive of bedplate, is fifty-two tons. The motor is controlled rheostatically. The current is led to the stator of the winding motor through the usual switches mounted on a switchboard in the engine house, and the main high-tension controlling switch. This switch is oil-immersed and operated by means of a small motor which is switched in and out by a relay operated by the controlling lever on the driver's platform. The controller for the rotor circuit of the motor consists of three sheet-iron tanks filled with a four per cent soda solution, into each of which dips a sector-shaped blade. The blades are fixed to an insulated spindle, which is worked by means of a compressed air servo-motor through gearing. The liquid in the tanks is circulated through a cooler and maintained at a constant temperature of about 140 to 160 degrees Fahrenheit. The valve of this servo-motor is controlled by the lever on the driver's stand. The action is briefly as follows: When the driver moves his operating lever from the vertical position he closes the relay controlling the auxiliary motor on the main high-tension reversing-switch, and current is switched through to the stator, while simultaneously the valve of the servo-motor is operated. The blades are thus caused to dip in the water of the tank until they are completely immersed and short-circuited, this corresponding to the extreme position of the operating lever. When the lever is moved forward the bottom rope coils on the drum, when backward the top rope. The only levers the driver handles are his controlling lever, by means of which he can start, stop, regulate the speed, or give reverse current to the winding motor, and his brake lever, which is interlocked with the controlling lever in such a way that the current in the motor is limited as long as the brake is not completely released. The safety appliances are simple but efficient. A three-phase solenoid operates a three-way cock, which places the brake-cylinder in connection, either with the air receiver or with the atmosphere. Should, therefore, the current fail, the armature of the solenoid drops, and works the valve, thus letting the air out of the brake-cylinder and causing the brakes to be instantaneously applied. If the cage is wound above a predetermined point, an auxiliary switch on the headframe breaks the circuit and actuates special relays on the main switches, causing them to trip. This brings the brake into action immediately. The brakes used are necessarily very powerful; with the engine running at full speed the drum is brought to rest in one and one-half revolutions, when the full brake power is applied. This corresponds to a run of sixty-six feet in the shaft. A Karlik speed-recording and registering apparatus fitted to the engine indicates the speed of the cages in the shaft on a dial, and registers on a chart the time

occupied by each wind, the speed in the shaft, and the time the engine is standing. This indicator is provided with a special device which causes the main switch to trip, and the brake to be applied should the speed of the cage exceed fifty per cent of the maximum when the latter is fourteen yards from the surface.

The total mass to be accelerated and retarded at each wind amounts to seventy-two tons at the drum radius; the acceleration occupies about twelve seconds, the run at full speed nineteen seconds, and the retardation and setting the cages on the keps seventeen seconds. The motor develops 1,700 brake-horsepower at the end of the acceleration period and 700 on an average during the run at full speed. The winding speed can be adjusted by means of the controller from a few inches per second upwards, for any length of time. The cage has four decks, all of which are changed simultaneously at bank and at bottom.

More Railroad Electrification in Switzerland.

The board of directors of the railroad being built in Switzerland between Bevers and Schuls, Bevers and St. Moritz, and Samaden and Pontresina, has decided to equip these three sections for electric traction. It is planned to have these lines in operation by the middle of 1913. Contracts for the electrical energy have been closed with the Electric Works Brusio for a period of ten to twenty years. Single-phase, 10,000-volt current at fifteen cycles will be used.

Steam-Driven Mines to Electrify.

The Economy Power Company, of Virginia City, has secured a contract to supply electricity to the Apex mine at Summit, which has hitherto been operated by steam power.

Another mining concern to electrify in the near future is the Killian Mining Company, near Bridgeport, Cal., which will shortly obtain electric power from the Casa Diablo property to operate an air compressor for opening up new veins.

Power Plant for Arizona Mine.

Recent advices from Bisbee, Arizona, state that the Sunset Mining Company will shortly install an electric generating station to supply power for mining purposes.

Electrical Development in the Southwest.

A recent dispatch from Laredo, Texas, states that preliminary steps have been taken towards the establishment of the largest electric power and transmission enterprise in the Southwest at a point about thirty-six miles above Laredo on the bank of the Rio Grande by a strong syndicate, headed by H. A. Stucky, an engineer. The proposed plant will be located in the center of a coal field embracing 45,000 acres which belongs to Mr. Stucky and associates. The coal screenings will be used to generate power which is to be conveyed by transmission lines to Laredo, Carrizo Springs, Cotulla and to a number of towns and cities of Mexico, including Monterey and Lampazos. Monterey is only about 150 miles distant from the site of the proposed plant, and it is claimed that it will be difficult to provide an ample amount of power for the great industries of that city. The Uvalde & Crystal City Railroad, which now runs between Uvalde and Carrizo Springs and is to be extended to the coalfield where the great power plant will be located, will be converted to electric traction and the power will be furnished by the proposed plant. The extension of this road will be about thirty-five miles long, making in all about 110 miles of track that will be operated by electric power.

The recent agricultural development of the upper Rio Grande valley by means of irrigation is very great. It is here that Bermuda onions are grown extensively. The water is pumped from the Rio Grande, and many of these pumping plants are operated at present by electric power furnished by the local light and power plant. It is planned by the new syndicate to furnish an unlimited amount of power for irrigation pumping plants on both sides of the Rio Grande for a distance of 100 miles along that stream. More than two million dollars will be expended in the enterprise. It is said that the initial capacity of the plant will be 50,000 horsepower, and this will be increased as the demand for the electrical energy grows. The coalfields that extend along the Rio Grande above Laredo are very extensive. Large mines have been worked for many years by a syndicate of Pittsburg men, the principal market for the coal being found in Mexico. D.

POWER FOR MINING.

COMPRESSED-AIR AND ELECTRICITY DEVELOPMENTS IN COBALT.

The report by the Temiskaming and Northern Ontario Railway Commission on mining and power developments in the Cobalt mining district of New Ontario, Canada, contains many interesting features on modern mining by water power, which Consul A. G. Seyfert, of Owen Sound, summarizes as follows:

The waterpower installations on the Montreal and Matabitchouan rivers are mainly for mining with compressed air. At Ragged Chute, on the Montreal River, eight miles south of Cobalt, a dam 660 feet long has been built by the Cobalt Hydraulic Power Company, and the head of water obtained is expected to develop 5,500 horsepower As compressed air for use in mines is the most convenient form of power, the system adopted is direct compression. The rushing and falling water sucks in and becomes mixed with air, and when the mixture of air and water plunges below the prepared lower levels, the rising bubbles of air are trapped and accumulate pressure in chambers connected with the distributing pipe.

Anyone who has stood on the bank of a great waterfall, such as Niagara, will have observed that an explosion at the foot of the falls is constantly occurring. This is caused by the compressed air produced by the rush of waters over the falls. This is the generated pressure that is being harnessed and controlled on the Montreal River for mining.

In the plant of the Cobalt company the air is compressed to 125 pounds, and carried to the mines by a twenty-inch conduit, and is to be sold to the consumers at twenty-five cents per thousand cubic feet at 100 pounds pressure.

At Hound Chute, on the Montreal River, two miles nearer Cobalt, the Cobalt Power Company has adopted electric generating. A dam twenty-seven feet high directs the water in a canal leading to the power house, which will develop 4,000 horsepower by four separate units of 1,000 horsepower each.

On the Matabitchouan River, about two miles from the Montreal River

landing on Lake Temiskaming, the Mines Power Company is installing four units capable of developing in all 10,000 horsepower. This company is building a dam 860 feet long at a height of fifty feet, which will give a working head of 312 feet. Each unit consists of a 275-horsepower turbine directly connected to an electric generator. This plant is nearly twenty-five miles from Cobalt, and will need four substations with transformers for distribution of the power.

Electric Cranes Wanted in Africa.

An American consul has forwarded copies of calls with specifications for furnishing one ten-ton and seven five-ton electric wharf cranes for an African port. Tenders will be received until October 12, which gives American firms a chance to compete. A list of firms which can be approached by cable to act as agents for American bidders is given in the report, and the consul states that as the market is a growing and permanent one it is well worth trying for. Particulars can be obtained by writing to the Bureau of Manufactures, Washington, D. C., quoting File No. 5274.

Electrically Driven Jute Plants.

The Indian Textile Journal states that two jute plants, one at Chitpore, India, and the other in the vicinity of this town, are being equipped with electric drive by the Lahmeyer Electrical Company, of London, Eng.

Hydroelectric Power for Mexican Mines.

The Mayo River Power and Land Company, of Denver, Colo., is preparing to erect several hydroelectric plants in western Chihuahua and eastern Sonora, Mexico, to furnish electric power for local mining properties.

Electrically Operated Fuel Plant.

The Carbonifera Italiana Company, of Venice, Italy, has recently completed a patent-fuel manufacturing plant, the machinery of which is all electrically operated. The plant occupies an area of about eight acres.

A 500-horsepower hydroelectric plant is being installed to furnish power for operating the Headlight mine in Trinity County, California. Other improvements are also being made.

FINANCIAL REPORTS OF ELECTRICAL COMPANIES.

UNITED RAILWAYS OF ST. LOUIS.

The report of the United Railways of St. Louis, for the month of June and six months ended June 30, 1910, compares as follows:

	1910	1909
June gross	$ 996,808	$ 960,964
Exp. taxes and depreciation	662,385	600,617
June net	334,423	360,347
Other income	2,668	3,060
Total income	337,091	363,407
Charges	232,897	232,322
June surplus	104,194	131,085
Six months' gross	5,605,501	5,373,678
Exp. taxes and depreciation	3,816,341	3,431,196
Six months' net	1,789,160	1,942,482
Other income	17,398	17,894
Total income	1,806,558	1,960,376
Charges	1,400,781	1,404,630
Six months' surplus	405,777	555,746

MONTREAL STREET RAILWAY.

The report of the Montreal Street Railway for the month of June and nine months ended June 30, compares as follows:

	1910	1909
June gross	$ 348,564	$ 354,917
Expenses	198,848	187,320
June net	185,715	167,597
Charges and taxes	59,053	51,134
June surplus	126,662	116,463
Six months' gross	3,091,799	2,791,973
Expenses	1,806,292	1,688,603
Nine months' net	1,285,508	1,103,370
Charges and taxes	377,603	335,691
Nine months' surplus	907,914	767,679

SOUTHERN NEW ENGLAND TELEPHONE.

The Southern New England (Bell) Telephone Company has issued its report for the year ended December 31, 1909, which compares as follows:

	1909	1908
Gross revenue	$2,473,346	$2,264,775
Expenses	1,926,944	1,725,885
Net revenue	546,402	538,890
Dividends	461,622	461,605
Surplus	84,780	77,285

ONTARIO POWER COMPANY, NIAGARA.

The Ontario Power Company, of Niagara Falls reports earnings for the month of June compared as follows:

	1910	1909
June gross	$ 55,853	$ 46,079
Expenses and taxes	11,209	87,234
June net	44,643	*41,155
Other income	6,409	5,176
Total income	51,052	*35,978
Interest	47,375	26,724
June surplus	3,677	*62,702

*Deficit.

NASHVILLE RAILWAY AND LIGHT.

The report of the Nashville Railway and Light Company for the month of June and six months ended June 30 compares as follows:

	1910	1909
June gross	$157,426	$144,461
Expenses	91,576	81,946
June net	65,851	62,515
Depreciation and preferred dividend charges	48,769	48,204
June surplus	17,082	14,310
Six months gross	887,954	831,704
Expenses and taxes	516,589	493,615
Six months net	371,365	338,088
Depreciation and taxation charges	291,195	283,610
Six month surplus	80,170	54,478

LAKE SHORE ELECTRIC.

The report of the Lake Shore Electric Railway Company for the month of June and six months ended June 30 compares as follows:

	1910	1909
June gross	$103,533	$ 95,825
Expenses and taxes	52,244	48,784
June net	51,289	47,041
Charges	34,751	34,479
June surplus	16,537	12,562
Six months gross	526,728	474,677
Expenses and taxes	298,698	278,376
Six months net	228,030	196,301
Charges	208,610	206,650
Six months surplus	19,420	*10,349

* Deficit.

MASSACHUSETTS ELECTRIC.

The report of the Massachusetts Electric Company for the quarter and nine months ended June 30 compares as follows:

	1910	1909
April 1 to June 30:		
Gross	$2,130,957	$2,040,177
Expenses	1,340,169	1,322,978
Net	790,788	717,199
Charges and taxes	418,237	458,477
Surplus	372,551	258,721
October 1 to June 30:		
Gross	5,819,184	5,425,967
Expenses	3,925,668	3,858,671
Net	1,893,516	1,567,296
Charges and taxes	1,333,424	1,346,070
Surplus	560,091	221,226

Electrical Exports for June.

The Bureau of Statistics of the Department of Commerce and Labor, Washington, D. C., recently issued its monthly summary of imports and exports for the month of June. While the report does not show as great a volume of business as did the previous month, it exceeds that of June, 1909, by a considerable amount. From the comparative monthly data it will be seen that in the matter of electrical appliances, the amount exported fell off by more than $100,000 from the preceding month. The value of electrical machinery exported failed to reach last month's level by a little less than that amount.

The comparative monthly data are as follows:

Electrical—	1910. June.	1909. June.	1910. May.
Appliances	$ 902,593	$ 595,044	$1,025,549
Machinery	586,202	667,453	684,938
	$1,488,795	$1,262,497	$1,710,487

The principal countries to which electrical products were sent last June, together with the values of these exports, are as follows:

	Electrical— Appliances.	Machinery.
United Kingdom	$ 41,140	$ 29,369
Belgium	3,769	
France	5,072	13,063
Germany	4,718	38,471
Other Europe	8,597	30,746
British North America	254,285	184,247
Central American States and British Honduras	30,989	26,525
Mexico	139,882	111,696
Cuba	31,895	3,270
Other West Indies and Bermuda	9,086	3,995
Argentina	73,510	11,073
Brazil	217,384	15,363
Other South American Countries	17,052	13,213
Japan	29,239	53,138
Chinese Empire		3,286
British East Indies		3,830
British Australasia	8,804	12,233
Philippine Islands	18,741	6,109
British Africa	4,038	19,542

New Electrical and Mechanical Apparatus and Appliances.

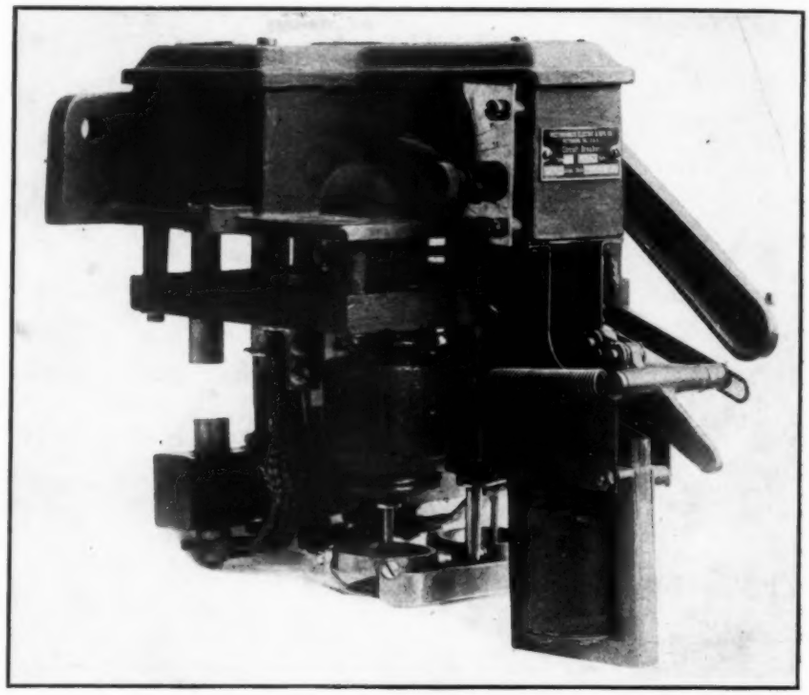
Oil Circuit-Breakers for Alternating-Current Circuits.

Realizing the need for a simple, reliable and, at the same time, inexpensive oil circuit-breaker for use in general industrial applications utilizing low potentials, the Westinghouse Electric and Manufacturing Company, a few years ago, placed on the market the now well-known type H oil circuit-breaker, designed for potentials not exceeding 600 volts and with a current carrying capacity of from ten to 300 amperes. This breaker was designed for mounting on a wall or post or any location convenient to the operator.

So successful have been the principles of operation embodied in the type H circuit-breaker, that it has been decided to extend this line to include breakers of the same current carrying capacity adapted for switchboard mounting, and for use on alternating-current circuits having potentials as high as 2,500 volts.

The new type, in addition to embodying all the distinguishing features of the old 600-volt type, also possesses several inherent advantages, the most prominent of which are the inverse time element and the "full automatic overload" release attachments.

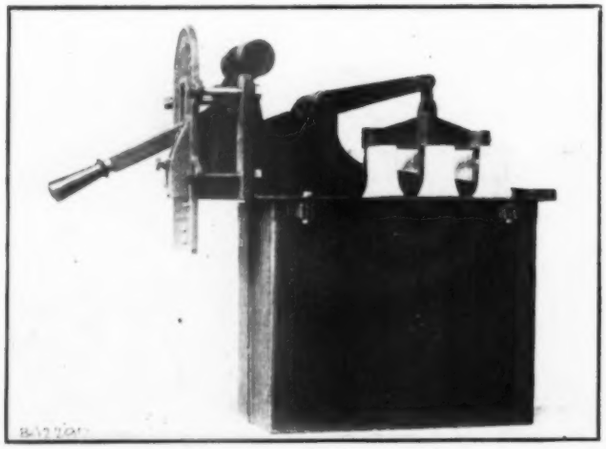
The type H oil circuit-breakers are equipped with overload-release trip coils suspended from the frame of the breaker, immersed in oil, and connected directly in series with the line. The plungers of these trip coils are retarded in their action by a device giving the circuit-breaker an inverse time element. The time element introduced is sufficient to permit the use of this type of circuit-breaker for motor starting service.



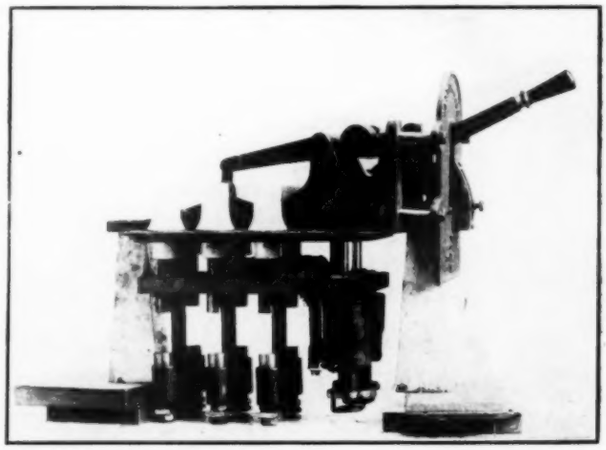
600-VOLT, TYPE H, OIL CIRCUIT-BREAKER FOR WALL MOUNTING.

The mechanism is known as "full automatic overload," that is, it is equipped with a device that renders it impossible to close the breaker or to hold it in the closed position while a continued abnormal overload condition or a short-circuit exists on the line. The time limit device, referred to above, permits the breaker to be closed under a momentary overload or rush of current such as is incident to starting an induction motor or throwing the controller to "running" position.

An under voltage release attachment which opens the breaker whenever the line voltage falls below a certain predetermined value can be supplied for these circuit-breakers. It consists of a magnet coil connected directly across



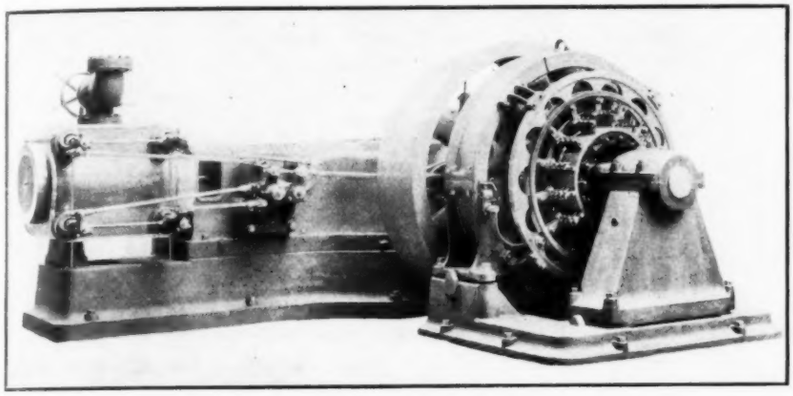
2,500-VOLT TYPE H CIRCUIT-BREAKER.



2,500-VOLT OIL CIRCUIT-BREAKER WITH COVER REMOVED.

the line for voltages not exceeding 600 and through potential transformers for voltages higher than 600. This coil is self-contained and is so designed that it may be attached to the breaker without any modification.

The 600-volt style has a single break to each pole, while in the 2,500-volt style there are two upper and two lower contacts for each pole, thus securing a double break per pole. The



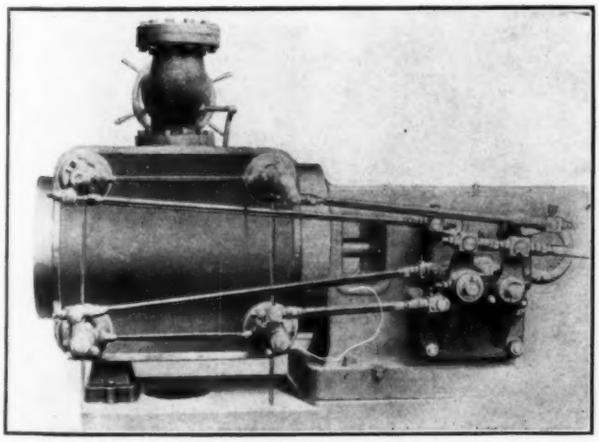
RIDGWAY ENGINE DRIVING DIRECT-CURRENT GENERATOR.

contacts consist of cylindrical brass rods, the lower ones being backed up by individual spiral springs to insure good contact, and form the well-known "butt" contact type. This method, familiar in the multiple unit system of control on heavy street railway equipments, has been adopted with great success in oil circuit-breaker practice. It insures good contact always and prevents any possible failure due to eating away the contacts by continued arcing. The compression springs mentioned take up any wear that may occur and render the contacts self-alining.

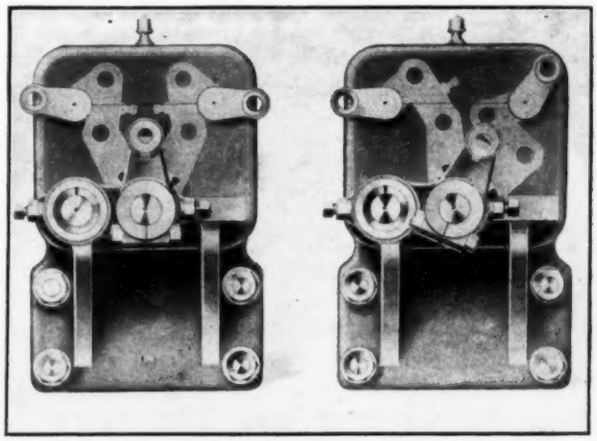
The Ridgway Four-Valve Engine.

Prompted by the demands of the electrical industry there have been many important developments in the design and construction of reciprocating steam engines. Several builders of high-speed engines have produced the present day four-valve, or so-called non-releasing gear, Corliss engine, with which better economy has been produced than with the releasing gear Corliss engine, without the disadvantages of slow rotative speed and a complicated valve gear. The Ridgway Dynamo and Engine Company, Ridgway, Pa., has produced a four-valve engine which is the product of a careful study of the failures and successes recorded in the process of development of the four-valve engine by the builders engaged in their construction, as well as of a recognition of the fact that the releasing gear Corliss has many valuable lessons to teach the designer of a new and improved type. The following facts have been kept in mind, namely, that high-speed of rotation demands a gear which has a positive connection with the driving eccentric; high economy demands quick opening and closing of the valves; and good regulation demands a sensitive but powerful governor and a minimum of friction in valves and gears, or in other words, the least amount of overtravel of the valve during the unbalanced period.

The first feature noted in the Ridgway four-valve engine is the valve gear, and in the mechanism which controls the steam valves will be found the principal difference between the older and newer types of engine. There is mounted on the bed a cast-iron case, called the gear case, combined with the rocker bracket which supports the exhaust wrist plate. Three shafts pass entirely through the gear case and are supported by bronzed lined bearings in each side of the case. The lower shaft is on the vertical center line between the two upper shafts and has mounted thereon three arms, two inside of the case and one outside. The outside arm is connected through the eccentric rod directly to the eccentric. The inside arms are the two sides of a single V-shaped casting, each side of which is composed of two parallel arms. Through the other ends of these arms passes a large pin, which forms a bearing between them. Both of the upper shafts have one arm outside and two arms inside of the case. The latter are parallel with a bearing between their outer ends corresponding to, and alining with, the bearings between the arms on the lower shaft. The two sets of arms are connected by links. From the outside arms on the upper shafts, reach rods extend to the arms on the valve stems.



DETAIL OF CYLINDER AND GEAR.



PHANTOM VIEW OF ACCELERATING GEAR.

The mechanical construction of the accelerating gear is such as to appeal favorably to the critical engineer. By mounting the gear case on the bed, or, as in the case with tandem compound engines, on the cylinder, the valve stem brackets are relieved of all strains except those necessary to open and close the valves. Furthermore, the brackets can be made larger and more accessible, making it an extremely easy matter to repack the valve stems. The gear case is divided along a horizontal plane passing through the center of the two upper shafts. The two parts are bolted together with stud bolts and the joint is made oil tight. By simply removing a few nuts the upper part of the case may be lifted and access secured to all parts of the gear. For adjustment and ordinary inspection a loose cover is placed in the top of the case. The gear case is nearly filled with heavy oil, which works into all of the bearings through grooves provided for that purpose. The accelerating gear is a system of toggle joints by means of which the motion from the eccentric is so modified that the valves are at rest during the major portion of the unbalanced period, and opening and closing occurs when they have their maximum velocity. The exhaust valve gear is identical with that used on releasing gear Corliss engines.

The cylinder is cast from a special mixture of iron, twice remelted and which is extremely hard. It is covered with a planished steel jacket and the space between the cylinder and jacket is filled with high-grade, non-conducting material. The valves are placed in the barrel of the cylinder in all sizes, their position being such that the ports are extremely short and direct, and the amount of clearance is as low as quiet operation will allow.

The bed of the engine is of heavy design throughout, with the metal so distributed as to bring the heaviest sections in line with the greatest strains. The main part of the bed is of box section having bored guides of large diameter. The guides and cylinder end are bored and turned at one setting on a special machine, thus insuring the perfect alignment of bed and cylinder. The main bearing on all sides is of the quarter box type.

The connecting rod is forged from the best open hearth steel, and is of the most liberal proportions, insuring ample strength under the most severe operating conditions. The cross head body is made of annealed cast steel. The shoes are of cast iron faced with babbitt and are of cylindrical type. The piston is a single hollow casting strongly braced by ribs and made as light as is consistent with strength. The special design, which is patented, makes the interior accessible for inspection, avoids the use of plugs and chaplets and also effectually prevents the occurrence of shrinkage strains. The piston rod is extra large in diameter and is made of special polished piston rod steel. The rod and piston are joined by a force taper pit, supplemented by a jamb nut. The rod screws into the cross head with a long fine thread and is held by a heavy jamb nut which is locked by a set screw in the cross head body.

The main shaft is a single forging of high carbon, open hearth steel. It is extra large in the bearings, and is proportionately increased in the governor wheel hub. The crank disc is made of a special mixture of cast iron and steel, designated "semi-steel," which is a very tough, close grained, hard iron. The crank pin is cast solid with the disc. The shape and thickness of the disc is such as to give greater strength and counter balance than is usual on side crank engines.

The governor used on all Ridgway machines is the Pioneer centrifugal-inertia governor. It is possible to adjust the engine so that it will run faster under load than when running light, and still have it regulated perfectly with no tendency to race; contrariwise, the governor may be adjusted to run slower under load than with no load. Dash pots are used on all engines, as by their use perfect stability is obtained, and at the same time they increase the ease with which adjustments may be made.

A special feature of this engine is the ratchet turnover device. By its use one man can turn the largest engine off center with ease. The entire device is heavy and durable, and the handle when removed is a serviceable pinch bar. When not in use the device turns backward out of the way of the governor wheel or any moving part.

The engine is provided with two standard methods of lubrication; the "splash system" being the one for which every engine is normally arranged.

The Ridgway four-valve engine is built in the simple, tandem compound and cross compound types. In all cases the design and proportions of the cylinder and valves are the same. On cross compound engines the valve gear of both cylinders is similar to that of the simple engine. On tandem compound engines the gear for each cylinder is similar to that of the simple engine, except that instead of the gear case being mounted on the bed it is monted on the cylinder. The sizes of the simple and tandem compound engines range from 100 horsepower to 900 horsepower and the cross compound engines are built in sizes up to 1,500 horsepower.

Western Electric Company Reports Large Sales.

The sales of the Western Electric Company for the seven months ending June 30 have been at the rate of $61,000,000 per annum, an increase of forty-eight per cent over the same period of the previous year. This has been made up largely of small orders. The officials of the company expect that the year's business will not differ materially from the average so far recorded.

The gross sales for the past ten years are shown in the following table:

	Gross Sales.	Increase.
1910	*$61,000,000	$15,000,000
1909	46,000,000	13,000,000
1908	32,000,000	†20,000,000
1907	53,000,000	†16,000,000
1906	69,000,000	25,000,000
1905	44,000,000	12,000,000
1904	32,000,000	2,000,000
1903	30,000,000	1,000,000
1902	29,000,000	5,000,000
1901	24,000,000	.....
1900	24,000,000	.....

* Estimated. † Decrease.

The Western Electric Company now has about 22,000 employees on its payroll, an increase of nearly 4,000 since the beginning of the year. Work on the additions to the plant at Hawthorne is nearly completed.

The Boynton Vacuum Pump.

On page 39 of the issue of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for July 2, figures were given in relation to the performance of the Boynton vacuum pump on a test run. Owing to the omission of one line these figures were not entirely correct, and should read as follows: The pressure at the end of two minutes' run was about 0.0001 atmosphere; after five minutes it was 0.00001 atmosphere; after eight minutes it was 0.000004 atmosphere; after fifteen minutes 0.000002 atmosphere.

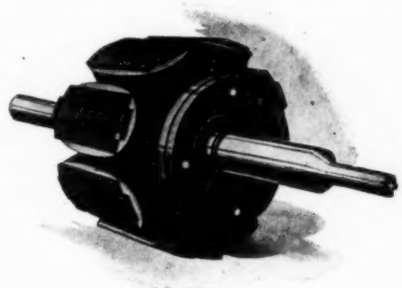
Design of Small Alternators.

Although many of the alternators used in power plants and factories are of less than 200-kilowatt capacity, it is seldom that sufficient attention is given to the characteristics of small machines by the ordinary purchaser.

One of the most important things to take into consideration is the wave form. Practically all engineering calculations and the design of recording instruments, motors, transformers, etc., are based on the assumption that the generator delivers a wave of approximately sine form, and any variation from this shape is of great importance.

In the stator shown herewith, which extent, upon the number of coils per phase per pole. In building small machines some manufacturers place only one or two conductors per phase per pole. This arrangement gives a very peaked wave form, and also in passing from zero to the maximum the electromotive force does not go through uniform changes, but has humps in it.

In the stator shown in Fig. 1, which is from a small alternator built by the Ideal Electric and Manufacturing Company, it will be noticed that there



VIEW OF ROTOR.

large number of slots also has the further advantage that it gives a more even distribution of the flux. This is especially important in small sized alternators, having open slots. Open slots are used in the generator shown, thus permitting the coils to be form wound and heavily insulated before insertion in the armature. It also has the advantage that in case of a burnout, coils can be easily removed without disturbing the remainder of the winding.

Another cause of poor wave form is the shape of the field pole pieces. The lines of force naturally pass from pole to pole through the path of least reluctance, and as the pole tips present

Other important features in the design of the alternator illustrated is the fact that both bearing boxes are directly bolted to the stator frame. The bearings themselves being of the split, ring-oiled, self-alining type, which offers a considerable advantage to the user in case it is necessary to remove the rotor for dismantling or making repairs. The oil is contained in large reservoirs, having outside gages to indicate the amount of oil present.

These alternators are designed for continuous operation at eighty per cent power factor, but their ratings are given on the kilovolt ampere basis at 100 per cent power factor. They have been recently placed on the market by the Ideal Electric and Manufacturing Company, of Mansfield, Ohio, and are built in sizes from twenty to 200 kilovolt amperes, two or three-phase and for various voltages and frequencies.

Interlocking Safety Switch Mechanism.

The increasing use of electricity for lighting and power purposes in mills, mines, factories, etc., has demonstrated the necessity for installation of safety devices which will tend to eliminate,

VIEW OF STATOR.

"IDEAL" ALTERNATOR.

are a comparatively large number of slots. Even in the smaller sizes these generators have at least three slots per phase per pole in three-phase generators, or four slots in two-phase generators, while in the larger sizes the number of slots is greater. Besides giving more conductors per phase per pole, a

the shortest path, the flux will concentrate here, giving an excessive magnetic density, unless special pains are taken to prevent this by shaping the pole pieces. This arrangement gives a practically uniform magnetic path and insures an even distribution of the flux in the pole face at all times.

as far as possible, the danger of accidents. That the importance of this is recognized, it is only necessary to note the large amount of legislation which has been enacted and is being considered for the protection of operatives.

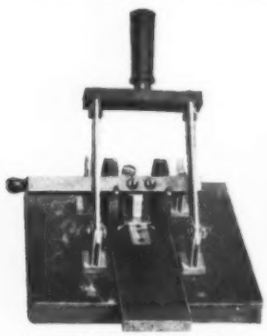
To meet the imposed conditions the

interlocking safety mechanism, illustrated herewith, was designed and originated from purely a safety standpoint. The device is so designed in its several forms so that it can be applied to controlling levers of practically every description, including valve wheels and electric switches as shown herewith.

The safety switch consists of a double-pole, single-throw knife switch between the top jaws of which is mounted the safety device, consisting of a pivoted locking bar, to which is fastened a substantial fiber cross bar and an operator's key, consisting of a metal key riveted to a rectangular piece of fiber.

These switches are always mounted in a perpendicular position, and when the switch blades are closed in the upward position the fiber-insulated arm on the locking bar is thrown up against the terminals of the switch jaws ahead of the cross bar of the switch blades. When the operator desires to open the motor-circuit switch he pulls the switch blades out from the jaws and down to the extreme lowest position. The act of doing this allows the fiber cross bar (which is pushed over beyond the center of gravity by a phosphor bronze spring) to fall over the switch jaws to such a position as to cause the locking bar to engage with the locking case. This locks the fiber cross arm or barrier between the switch blades and jaws effectively, preventing the blades from accidentally being closed, which might result in a serious accident.

This new safety switch, manufactured by the Delta-Star Electric Company, Chicago, is valuable as a means of protection, not only from loss of life or accidents to electrical apparatus, but in reminding the individual when going through the process of operating the switch what he is about to do, as there is an element of time in which the operator has time for thought.



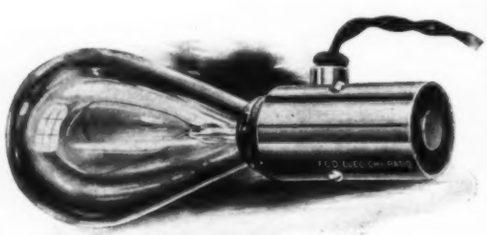
INTERLOCKING SWITCH.

Federal Magnetic Socket.

A very convenient device in the form of a magnetic lamp socket is being placed on the market by the Federal Electric Company, Chicago, Ill. The fact that this socket can be firmly fixed at any angle on any iron or steel surface is responsible for its wide adaptability and makes it an ideal lamp for machinists and as an exploring lamp for automobiles.

As a machinist's lamp it places the light exactly where it is wanted, leaving both hands free. As an exploring lamp for automobiles it does away with the danger of explosions from open flame lights and also eliminates the inconvenience incidental to the use of the pocket electric flash light.

The Federal magnetic socket consists of a cylindrical socket, two and three-fourths inches long (not including lamp) and one and one-half inches in diameter, fitted with a lamp socket in one end and an electro magnet in the other. This magnet is of sufficient strength to hold the socket firmly at any angle on any iron or steel body. It is wound separately from the lamp circuit so that in the event of accidental breakage or burning out of the lamp the current still operates to hold the socket in place.



FEDERAL MAGNETIC SOCKET.

With this magnetic socket the lamp can be located in the most convenient position, and while it is held firmly as long as it is needed it can be removed by a slight pull when the user is through with it.

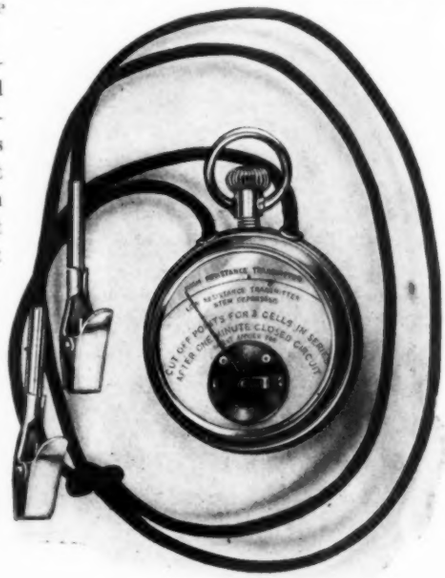
The socket is furnished wound for use on 110-volt circuits with standard base lamps, and for use on forty-volt circuits with candelabra base lamps, and on six-volt circuits with candelabra base lamps. The forty-volt type is adapted for use on electric automobiles, while the six-volt type can be used on the sparking or headlight batteries of gasoline machines.

The Western Electric Watch-Case Battery Gauge.

The No. 30 battery gauge recently developed and placed on the market by the Western Electric Company is a compact instrument for measuring accurately and efficiently the strength of telephone dry batteries used in connection with Western Electric transmitters. It is designed for connection to three cells in series, duplicating conditions of the local battery subscribers' set. It contains apparatus for gauging current through two resistances, corresponding to high and low resistance transmitters.

The No. 30 gauge is in watch-case form, and the view which is shown herewith demonstrates the convenience of the arrangement. It contains no scale but is designed merely to show the point at which batteries should be put out of service. For the high-resistance transmitter a mark above the arc on the face of the gauge is used to denote the cut-off point. This means that current from the three cells is being sent through twenty ohms resistance. The cut-off point is 140 milli-amperes, a point which conforms with the best telephone practice.

When the stem of the watch-case is depressed, fifteen ohms resistance are removed, leaving only five. This produces the conditions of the low resistance transmitter, and the cut-off point, which is indicated below the arc, is 420 milli-amperes. This gauge may be easily carried in the pocket.



WESTERN ELECTRIC BATTERY GAUGE.

Current Electrical News

GREAT BRITAIN.

(Special Correspondence.)

LONDON, JULY 23.—The General Electric Company of London, as owner of the Osram metal-filament lamp patents, has commenced a series of lawsuits against a number of importers of foreign metal-filament lamps who are alleged to infringe both the master patent and a number of minor patents. In this connection it is interesting to note that the British Thomson-Houston Company has joined hands with the General Electric Company and has taken a license from the latter.

The bill providing for the compulsory installation of wireless apparatus upon all ships carrying passengers, which I briefly mentioned last week, is a private member's bill and although there is no possibility of it proceeding any further this session, it has received a considerable amount of support. It proposed that all ships carrying, either as passengers or crew or both, a larger number of persons than fifty, should be compelled to have a wireless outfit on board, under a penalty of $5,000, the apparatus to have a range of at least 100 miles. It is generally understood that the Board of Trade itself is in favor of such a measure but that certain considerations prevent official recognition being given to this view at present.

An association of consulting engineers has just been formed in London, membership of which, it is hoped, will give a status which will absolutely prevent "touting" for work by unqualified men. As most of the leading independent consulting engineers in London have already joined there is every possibility of the aim of the Association being achieved. In spite of rules of etiquette issued by the Institutions of Electrical and Civil Engineers, cases do happen in which they are not adhered to, and if "touting" for work is to be tabooed in this country, then some organization should exist, membership of which will assist municipal corporations and other bodies in knowing that they are employing a duly qualified man.

The wiring of premises and the supply of fittings by municipalities owning electricity undertakings is still being seriously discussed in municipal circles, and the Municipal Electrical Association is inquiring of all municipal bodies whether they will support the promotion of a bill in Parliament next session to make this legal. The case between the municipalities and the contractors has certainly taken a turn for the worse, for comments of the most caustic nature are being made in many council chambers by municipal engineers who, a few years ago, regarded the local wiring contractor as their best canvasser. At Dundee it has been stated that as an experiment the canvassing of the electric-supply department was slackened off for a certain period in order to see whether the contractors really meant business, but the amount of business done in that period fell off materially.

The overhead system of the London County Council tramways in South London has been found to interfere with the working of the signals upon the single-phase line of the London Brighton and South Coast Railway in that district, and Prof. Gisbert Kapp, president of the Institution of Electrical Engineers, has been appointed to arbitrate. An earth return is being used in connection with the signaling arrangements on the railway, and the company's engineer proposes to install a metallic return at the cost of the London County Council, but this is not to be agreed to without a fight.

J. H. Rider, who has been responsible for the design and running of the electrical system of the London County Council tramways, has resigned his appointment as chief electrical engineer, in order to take up an advisory post with Messrs. Eckstein in connection with the important group of mines which they control on the Rand.

The Central London Railway Company is raising the new capital for construcing an extension of its line to Liverpool Street, so as to connect up with the important terminus of the Great Eastern Railway Company. This extension must be regarded as of the highest importance to the traveling public in London.

Contracts have just been placed for 250 more electric tramcars by the London County Council. The new tramways, for which powers will be sought in the next session of Parliament, aggregate twenty-two miles of single track, the estimated cost of construction alone being nearly $2,500,000.

It is officially announced that the new submarine telephone cable between England and France, in which loading coils are used, has been working very satisfactorily on test. It will not be brought into regular use until further land lines are available on the French side. Further, it is announced that the French Government proposes to lay a similar cable across the Channel. Experiments are now being made over the cable just laid in order to establish speech as far as Berlin and other German cities. G.

CONTINENTAL EUROPE.

(Special Correspondence.)

PARIS, JULY 22.—One of the largest electric railroads in France is the line which will run from Bayonne, in the Atlantic coast region, to the station of Montrejeau and from thence to the town of Pau, a well-known resort in the Pyrenees region. Water power will furnish the current, and the Southern Railroad Company which is engaged in the present project is taking steps to erect one or more turbine plants in the mountains. As regards the section running from Montrejeau to Pau, the French Thomson-Houston firm recently made a contract with the railroad company in order to carry out the work.

Among the vacant electric traction projects in France I note a project in the Loir and Cher department for lines running from Selles to Contres, also from Clery to Amboise and from Ouques to Chateaudun. Work will soon be carried out upon the Bayonne-Biarritz steam railroad line in order to change over to electric traction. In Normandy there is a project on foot for an electric tramway line fom Pont L'Eveque to Mezidon, and the electric station will also distribute current throughout the region which the line traverses. The general Council of the Haute Marne department has adopted projects for no less than ten different electric traction lines, among which are a road from Chaumont to Bourbonne and from Giey to Auberive.

In the region of Trieste, Austria, there is to be built an electric rack railroad from the locality of Lovrana in order to climb the Monte Maggiore. The undertaking will be carried out by the Union Baugesellschaft of Vienna. Another electric traction enterprise in the same country is a narrow-gauge line which is to run from Pokau to Tellnitz.

An extensive turbine station will be erected on the Saalach River, Germany, and the current will be used for the railroad section from Freilassing to Reichenhall, upon which electric traction will be applied. It is expected to use four turbine groups of 2,500 horsepower in the first part of the turbine plant, working with a head of water of seventeen meters.

An electric tramway line of eight miles length will be built in the Tuscany region of Italy from Valdarno to Levane with a branch line running to Terranova, according to the project which the Valdarno Company is promoting, and it expects to receive a subsidy from the government. I also note that the Ursolina Company secured a concession for operating electric lighting mains in the city of Florence. A power line is to be run from San Cristoforo to the locality of Gori.

In Holland there is a project on foot for an electric traction line from the Hague to Leyden. A. DE C.

EASTERN CANADA.

(Special Correspondence.)

OTTAWA, ONT., JULY 30.—As the Sherbrooke Power and Railway Company, of Sherbrooke, Que., cannot come to an agreement with the owners of certain power on the banks of the Magog River, the company will expropropriate the same. The property is needed in connection with a dam to be built by the company.

Deputations from the towns of Huntsville and Bracebridge, Ont., have waited upon the Ontario government regarding power development at High Falls. The latter town obtained leave to begin the development two years ago on condition that the former got a share of the power. This condition not having been observed the town of Huntsville now asks to be allowed to develop power.

The interests, in which Sir William Van Horne is a prominent figure, which are after water power at Grand Falls, New Brunswick, for commercial purposes, appear to be on the point of winning out in the contest. The latest information from New Brunswick states that as a result of the conferences between rival interests, held at St. John recently, substantial progress has been made in the negotiations for control of the Grand Falls power development by Sir William Van Horne's company. It is also stated that the latter company desires soon to begin the construction of a hydroelectric plant and pulp and paper mills at the Falls. Among those present at the conferences were Barton B. Kinman and Harry McLoughlin, on New York members of the Grand Falls Power Company.

Changes of an important nature are being effected in the Canadian end of the business of the Pacific Cable Company. J. Milward, the Australian manager of the concern, and A. S. Baxendale, the chairman of the London Board, have been in Canada for some days completing arrangements with the Canadian Pacific Telegraph Company to lease a special line from the latter company, in order that there may be no break in the cable company's direct communication across this continent. The stretch of wire, leased by the

cable board, will be operated at once, and the most modern machinery and equipment available will be installed in all Canadian stations. The board is making improvements of a double character in connection with its leased wire. The first has reference to the safety of the code; the second to speed. The latter improvement includes the Wheatstone machines for rapid transmission, and will be installed at the four relay stations. The equipment at this end will be capable of handling 300 words per minute. W.

MEXICO.

(Special Correspondence.)

MEXICO CITY, MEX.—The Balsas Power and Irrigation Company which has been organized with a capital stock of $200,000 will install a hydroelectric plant on the Balsas River in the state of Guerrero. The project is being promoted by A. B. Adams & Company of New York. The concession for the enterprise was obtained from the Mexican government by Francisco Alfaro of Mexico City, attorney for the Company. It is stated that the plant will be sufficiently large to generate power for mines and other industries covering a big scope of territory and that the capital stock of $200,000 is only nominal. The company will also irrigate a large tract of land in connection with its electric power enterprise.

More than one thousand men are employed in the preliminary work for the construction of the great dam across the Conchos River twenty miles from Santa Rosalia, State of Chihuahua, for the Mexican Northern Power Company. The new town of La Boquilla is springing up near the dam site. Many houses are being built for employes. The rainy season has interfered with the construction of the dam, but the contractors, S. Pearson & Son, Ltd., are assembling large quantities of material upon the ground so as to be ready for rushing the work as soon as the dry season sets in. An important feature of this project is the proposed impounding of water by means of the dam, sufficient to irrigate about two hundred thousand acres of land in the valley of the river.

Dr. M. D. Shaw of Puebla has made application to the state government for a concession to install a large hydroelectric plant on the Rio de Tonalapa, near Tetela. He will organize a company to take hold of the project. D.

IMPORTANT DEVELOPMENTS.

(Special Correspondence.)

NEW SOUTHERN POWER PLANT.—The Thornton Light and Power Company, of which Colonel M. E. Thornton is promoter, has disposed of $1,000,000 of bonds, and is preparing to begin the construction of its new hydroelectric power plant on the Catawba River at Hickory, N. C. Surveys and preliminary work have been completed. The plant will develop 9,000 horsepower. More than half of the capital needed for the establishment of the plant has been secured. Negotiations are pending between the power company and a Canada inventor and associates who desire to erect an electric smelting plant at Hickory for the reduction of iron ores. This plant, if established, will represent an investment of approximately $750,000.

A NEW DAM FOR WISCONSIN.—It is reported that John I. Beggs, of Milwaukee, will spend $1,000,000 during the next three years in developing the waterpower of the Upper Wolf River. The power will be used for the operation of the interurban system in the Fox River valley. The necessary property has been secured near Gardner's dam, located in Langdale County, about seventy miles from Appleton. The water power plant will be subsidiary to the one the company now operates at Appleton, and it will have a reserve steam plant for use in case of drouth. The traction company's dam will be thirty-five feet high. Water will be carried from there through two steel or concrete flumes for a distance of a mile and one-half down the river to the power plant. In that mile and one-half the river drops sixty feet, giving a total fall of ninety-five feet. It will take two years to complete the work. A steam plant will be provided for use in emergencies, so that the operation of cars and lighting plants will not be dependent upon the amount of water available.

POWER TUNNEL UNDER THE SPOKANE RIVER.—Five hundred thousand dollars will be expended by the Washington Water Power Company in tunneling under the Spokane River for about a quarter of a mile west from the upper falls in the business district of Spokane, where four waterwheels of 1,000 kilowatts capacity will be installed to generate the desired power. Work has been started by the Church and McCoy Company of St. Paul, which also has contracts to erect a three-section car barn to cover a block. The tunnel work is similar to that under Niagara Falls and presents the same engineering feats. This method of utilizing the power of the Spokane River will give a direct fall of 144 feet or about twice what is secured at present by using the lower falls. It is impossible to give the entire estimated cost, as this preliminary work on the shaft will have to be completed first to get at the real tunneling work. It is safe to say, however, that the cost will be around $500,000, possibly more. Three temporary compressed air drills, each of 250 horsepower, are in operation and will be supplemented by a compressor of 1,200 cubic feet a minute. The working shaft of the tunnel, ten by twenty feet, will be sunk 150 feet. From the bottom of the shaft the tunnel will be driven 1,000 feet up and down the river.

LIGHTING AND POWER.

(Special Correspondence.)

BLUNT, S. D.—Construction will soon commence on an electric light plant. C.

OWATONNA, MINN.—A franchise has been granted to install an electric light plant. C.

GILBERT, MINN.—Local business men propose to ask for a franchise to install an electric light plant C.

CALMAR, IOWA.—A franchise has been granted to C. Miller & Sons, of Clermont, Iowa, to install an electric light plant. C.

BROKEN BOW, NEB.—The Broken Bow Electric Light Company will erect a power house at the rear of the Burlington depot. C.

GRISWOLD, IOWA.—J. W. Daly will expend $3,500 in changing the electric light plant from a direct to an alternating current system. C.

LIBBY, MONT.—Geo. H. Stanton, C. C. Proctor, and E. K. Barnum have applied for a franchise to put in an electric-light plant. C.

IRONWOOD, MICH.—It has been voted to grant a franchise to the Ashland Power Company to install a light, power and heating plant. C.

SUN PRAIRIE, WIS.—A vote will be taken August 9, on issuing bonds for $12,500 for the purchase of the local electric-light plant. C.

BROWNS VALLEY, MINN.—W. J. Potts is considering the establishment of a waterpower plant on the Little Minnesota River, west of town. C.

St. PAUL, MINN.—The South St. Paul Light, Heat and Power Company is considering the expenditure of $10,000 in improving the lighting system. C.

FAIRMONT, MINN.—It is proposed to take a vote in August on issuing bonds for $30,000 for improvements in the electric light plant and water works. C.

MANCHESTER, IOWA.—The Manchester Light, Heat and Power Company has let the contract for a 150-horsepower boiler and two fifteen-kilowatt transformers. C.

PELICAN RAPIDS, MINN.—The contract for an addition to the electric light plant has been let to the Power Engineering Company, Minneapolis, at $4,521. C.

BAKERSFIELD, CAL.—The Mount Whitney Power Company has been awarded a fifty-year franchise to erect poles and string wires for light and power in Kern County. A.

VIRGINIA, MINN.—The value of the franchise and plant of the Virginia Electric Power and Light Company, which the city proposes to purchase, is estimated at $300,000. C.

BLUNT, S. D.—The material has arrived for the new electric light plant which is to be installed here. The work of completing the system will be pushed as promptly as possible.

TACOMA, WASH.—George Milton Savage and W. Nichols have been awarded the contract for constructing the headwork and tunnel of the $2,000,000 municipal power plant in the Nisqually River.

CAMBRIDGE CITY, IND.—The town trustees have taken steps to increase the capacity of the electric-light plant. The proposed improvement and purchase of new equipment is estimated at $15,000. S.

WILSON CREEK, WASH.—C. J. Weller has been granted a fifty-year franchise to operate an electric light and power plant here. Mr. Weller will begin the construction work on the plant, this summer. A.

OKLAHOMA CITY, OKLA.—The work of installing posts for the new street-lighting system is well under way. The posts and lights are similar to those used in Minneapolis, Des Moines and some other cities.

WEST LIBERTY, IA.—Work has been started on improvements at the power plant. A new brick boiler room, 28 by 42 feet, will be built and a 200-horsepower Corliss engine and new generator will be installed. C.

SNYDER, TEXAS.—The Snyder Ice, Light and Power Company has let the contract for the erection of an electric power house at its ice factory here. The building will be of brick, with concrete floors, and 40 by 40 feet in dimensions. D.

KINDERHOOK, N. Y.—The Kinderhook Electric Light Company has been organized to operate a heat, light and power plant. The capital is $1,000 and the incorporators are John B. Gose, Hiram S. Churchill and Chas. J. Gose.

GLANDORF, O.—This municipality is now lighted by electricity, the power being supplied from the plant at Ottawa, O., one and a half miles distant. The current was turned on a few days ago. Tungsten lights are in use. H.

WHAT CHEER, IOWA.—The value of the property and plant of the What Cheer Electric Light and Power Company has been placed by the appraisers appointed by J. M. Stephenson, receiver, at $7,000, based on the earning power of the plant. C.

AUGUSTA, GA.—This city is to join ranks of progressive

Georgia cities arranging ornamental light effects for city streets. In Augusta lamp-posts supplied with tungsten lamps are to be erected on Jackson Street extending between Broad and Telfair streets. B.

MARION, IND.—The city council has declared that the field is now open to any company or person who wishes to bid on a new franchise for an electric light plant. The council revoked the franchise of the Indiana Gas & Electric Company over a year ago. S.

MARTINSVILLE, IND.—The city council has voted to make extensive improvements in the municipal electric light plant. Considerable new machinery and equipment will be added. H. K. Johnson, engineer, estimates the cost of the new equipment at $10,000. S.

MANILA, P. I.—Patrick J. Moore, lawyer in Zamboanga, is here to secure a franchise for an electric-lighting plant to be erected in Zamboanga. The franchise has been approved by the municipal council and is now awaiting final permission from the Commission. A.

RICHMOND, VA.—The Richmond Power Corporation has been incorporated by S. Dabney Grenshaw, Levin Joynes, both of Richmond; F. W. Ter Menlen, New York; St. John Clarke, New York, and Henry B. Twombley, New York. The capital of the company is $500,000.

PLAIN CITY, UTAH.—Before the close of the present year Plain City homes will be lighted by electricity. Arrangements have been made with the Hone Telephone and Electric Company of Farmington, Davis County, a distance of twelve miles, and work will begin in a short time.

MELLEN, WIS.—Owing to the favorable vote on the light and street car franchises at Ironwood, Mich., A. E. Appleyard, of Ashland, Wis., will develop the waterpower at Copper Fall, near here. Mr. Appleyard will expend nearly a million dollars on all the work he has in view on the range. C.

LEWISTON, IDA.—The Lewiston-Clarkston Investment Company has closed a contract with the Washington Water and Power Company of Spokane, Wash., for electric current to be received at Moscow on a new transmission line to be constructed from Palouse to Moscow, connecting there with the Lewiston system. A.

COLFAX, WASH.—Henry M. Richards, president of the Washington Waterpower Company, has placed a proposition before the city council to remodel the entire electric-lighting system of Colfax. The council is inclined to grant Mr. Richards' petition which places the cost at about a third of the other propositions received. A.

EAST ST. LOUIS, ILL.—The Citizen Electric Light and Power Company, the Southwestern Light and Power Company and the East St. Louis Light and Power Company, all of East St. Louis, have certified to the secretary of state that a consolidation has taken place under the name of the latter company with a capital of $1,000,000.

SAN LEANDRO, CAL.—Crossed wires started a fire that destroyed the powerhouse and engine house, valued at $50,000, on the I. W. Hellman, Jr., estate at San Leandro on July 21. The Hellman grounds were for a time deprived of electric lights but until a new plant is built the Hellman estate will receive current from San Leandro. A.

NASHVILLE, TENN.—The Eastern Tennessee Power Company has secured a charter from the Secretary of State. The capital stock of the company is $1,750,000. The corporation is formed for the purpose of improving and developing a water and electric power plant in Polk County. The incorporators are: Henry S. Beck, W. Sherman Beck, J. D. Alsup, R. L. Westcott and Henry Crumbliss.

VALDOSTA, GA.—The Consolidated Light and Power Company has filed a petition with the State Railroad Commission for the privilege of issuing $50,000 in stock, and also $75,000 in bonds of the company, for the purpose of putting in a light and power-generating plant in this town. The company also proposes to operate an ice plant in conjunction with the power-generating plant. L.

POST FALLS, WASH.—An electric power line from Post Falls to Newport will be finished by the Washington Water Power Company before February 11, 1911. The engineers of the company are now on the locating survey, and right of way is being bought. The Spokane Company is under contract to furnish light and power to the Northern Idaho and Montana Power Company at Newport on February 11.

GRAND FORKS, N. D.—An increase of seventy-five per cent in the capacity of the Grand Forks electric lighting plant of the Red River Power Company, the concern organized since the purchase of the Grand Forks Gas and Electric Company by H. M. Byllesby & Company of Chicago has been announced. Work is to be commenced immediately. The new company has announced that there would be a reduction in the rates on both gas and electricity.

BRUNSWICK, ME.—The Brunswick Power Company, which was organized under a charter granted by a special act of Legislature, has filed certificates of organization. The president of the corporation is Constant Southworth, and the treasurer is Arthur S. Bosworth. The directors are Frederick O. Conant, Ernest J. Eddy, George F. West, Constant Southworth, William D. Sewall and Arthur S. Bosworth. The company is capitalized at $750,000.

VISALIA, CAL.—The assessment of the Mt. Whitney Power Company has been raised from $355,695 to $405,895—a total of $50,000. The increase in valuation was figured on the three power plants of the company, the two on the Kaweah River being raised $15,000 and the one on the Tule River, $20,000. The assessor had already made an increase in the company's assessment over last year of $118,000. A.

DEVINE, TEX.—At a recent meeting held at the opera house a proposition was offered by Messrs. Burnett and Fennenman of Indianapolis, Ind., to install an electric light plant and ice factory. The company they asked a site for the location for the enterprise as a bonus, and a committee was appointed to secure funds in order to buy the location, which is one of the most valuable pieces of property in Devine. Mr. Burnett says that work would begin at an early date and the plants would be in operation within a short time.

GREENVILLE, S. C.—The Home Light and Power Company, commissioned by the State, is preparing to enter the field at this point, W. S. Lee, vice-president of the Southern Power Company, being an incorporator. The capital is $100,000 and the franchise, which has been granted by the city, is for thirty years. Lewis W. Parker, Thomas F. Parker, J. E. Sirrine, W. J. Thackston, L. Rothchild and Jos. A. McCullough, are, with Mr. Lee, the incorporators. Work, it is said, will be started inside two months time from date. L.

MONTGOMERY, ALA.—The Citizens Light, Heat and Power Company, the control of which was recently purchased by Richard Tillis a local capitalist and owner of the Montgomery Traction Company, is preparing to make extensive additions to its power house and extend its lines to all sections of the city. Large steam turbines and other equipment of the most efficient type will be installed which with the favorable location and low capitalization of the company will enable it to furnish a superior service at a very low cost.

SAN FRANCISCO, CAL.—Stone & Webster of Boston have assumed the management of an additional electric power company, known as the Sierra-Pacific Electric Company. This company owns all stocks of companies which do the entire electric lighting and power business in the cities and towns of Reno, Sparks, Virginia City, Carson City and Silver City, Nev. As the water power now developed is insufficient to supply the present and increasing demand for electric power in and about these places, a new plant of 9,000 horsepower will be constructed this year. A.

COLUMBUS, O.—The city light plant is now furnishing most of the power that runs the Kilbourne-Jacobs Manufacturing Company, and the Union Fork and Hoe Company, and it is receiving $2,000 a month therefor. The contracts with these firms were recently made. It is the hope of Superintendent Herman Gamper that after next year the city plant will be wholly self-sustaining. For next year he is asking only $30,000, as against $75,000 previously for the plant's sustenance. Other contracts for furnishing power will probably be signed before the end of the present year.

RALEIGH, N. C.—The board of aldermen has just closed a ten-year contract with the Carolina Power and Light Company for lighting the streets of the city for the next decade, with magnetite arc lamps. Alderman Harden, chairman of the lighting committee, reported the result of the committee's investigation, which recommended the signing of the contract. The contract is effective May 1, 1911, but the Carolina Power and Light Company agrees to operate the lighting system at $55.75 per lamp until that date, and then at $60 per light per annum, the rate under the new ten-year contract. L.

NORTH YAKIMA, WASH.—The Pacific Power and Light Company has been incorporated for the purpose of taking over the Portland Gas Company, the Columbia Power and Light Company, the gas companies of Walla Walla, Pendleton, and at Lewiston, Idaho, and all of the electric plants and distribution systems in the Yakima Valley. A 66,000-volt line is being constructed from Walla Walla to Pasco to connect the stations of the Columbia Power and Light Company with that of the Yakima plant. To accommodate the extra transformers, an addition to the present substation at Walla Walla is being constructed. A complete new switchboard equipment will be installed.

LOS ANGELES, CAL.—Within a few weeks the steam power plant of the Pacific Light and Power Company on Santa Fe Avenue will be put into operation. It is customary to operate the auxiliary steam plant during the summer months, when the power generated from water pressure in the mountains is insufficient to supply the requisite amount of juice. The main steam plant of the company at Redondo is now undergoing an overhauling, so the company is forced to draw upon the Santa Fe Avenue establishment. At the longest it will be operated for a few months only, as the winter rains and mountain snows will speedily replenish the depleted streams and thus relieve the company of the necessity for manufacturing juice by steam.

ELECTRIC RAILWAYS.

(Special Correspondence.)

LOS ANGELES, CAL.—The Pacific Electric Company will soon begin work on a twelve-mile extension toward Riverside, Cal. A.

MASON CITY, IOWA.—The Mason City & Clear Lake Railway Company has been incorporated with a $1,000,000 capital. Several extensions of the line are planned. C.

IRONWOOD, MICH.—A franchise for a street-railway and lighting plant has been granted to Albert D. Johnson, Lawrence D. Sullivan, Arthur E. Appleyard and Manuel M. Reid.

IOWA CITY, IA.—The Iowa City-Ottumwa Interurban Railway company stock is selling rapidly. When the special canvass began, $70,000 of the $100,000 wanted was in sight.

DULUTH, MINN.—The Duluth Street Railway Company has placed a mortgage of $2,500,000 on its property. The amount realized will be expended in improving the service. C.

DES MOINES, IOWA.—The contract has been let to Mr. Kuhn, of Omaha, Neb., for the construction to Adel, Iowa, of an electric line, in which Flynn Bros., and others are interested. It will be twenty-nine miles long.

CLEVELAND, O.—Preliminary work has been begun by the General Traction Development Company, of Cleveland, on the construction of a traction system of 107 miles radiating from Mount Gilead and connecting Mansfield and Mount Vernon.

FOSTORIA, O.—The promoters of the Fostoria-Fremont electric line, connecting the Lake Shore Electric and Ohio Western Electric lines, were granted a twenty-five year franchise by Sandusky county commissioners. The line must be completed within a year.

SAN MARCOS, TEXAS.—O. E. Metcalfe of San Marcos is making a survey for the proposed street railway system that is to be constructed here. It is planned to start construction work as soon as the survey is finished and to have the system finished by January 1. D.

SALT LAKE CITY, UTAH.—The Electric Railway Company has been incorporated by business men of this city, with a capital stock of $1,500,000. The purpose of the company is to operate an electric interurban railway from Salt Lake City to Utah County Points. A.

EVANSVILLE, IND.—The officials of the Evansville, Mt. Carmel and Onley Traction Company announce that the bonds have all been sold and that the Burnes Construction Company of Chicago, which has the contract has been instructed to proceed to the construction of the road at once. S.

HANFORD, CAL.—The Hanford & Summit Lake Railway Company has been incorporated with a capital of $5,000,000. The company will construct a line from Hanford through Grangeville and Hardwick in the Summit Lake region and will return through Lemoore and Armona, a distance of about fifteen miles.

BOWLING GREEN, O.—Plans are under way for the extension of the Lake Erie, Bowling Green & Northern Electric Railroad to Elmore on the east and to Grand Rapids on the northwest, giving about thirty-five additional miles of line. Business has greatly increased since the extension of the line to Tontogony. H.

SUMMIT, MISS.—A charter has been granted C. V. Ratcliff, Ted Blackman, and V. Simmons, all of Summit, for The Summit Electric Line. The line is to be built for accommodation of Summit's residents and those of McComb and is to develop Godbold Wells as a health and pleasure resort. This company is capitalized at $40,000. B.

MEMPHIS, TENN.—The Tennessee Traction Company has decided to increase its stock from $50,000 to $2,000,000. This is done to enlarge the plans for an interurban between Memphis and Jackson. According to the larger plan subsidiary lines will extend from the main line to Dyersburg, Covington, Ripley, Tenn., Fulton, Ky., and other towns.

NUEVO LAREDO, MEXICO.—The electric street railway system of this place which was recently completed, was placed in operation July 17. The system was built and is operated by F. E. Scovill of Laredo, Texas, which town is situated immediately across the Rio Grande River. Power is furnished from the plant of the Laredo Power Company at Laredo. D.

TOLEDO, O.—The capital stock of the Ohio Electric Car Company, has been increased from $75,000 to $150,000. The concern manufactures an electric automobile and its stock was doubled to increase its working capital. Some of the most prominent capitalists in the city are interested in the company. A. M. Chesbrough is president, R. E. Lee, vice-president, and F. D. Suydam secretary. H.

SUNBURY, PA.—The new power plant of the Sunbury and Selinsgrove Electric Street Railway Company was put into operation recently and now supplies current for the lighting of the park and the running of cars. The plant is a model of its kind and generates sufficient power for all necessities of the trolley line. It is equipped with the latest electrical machinery. The company has hitherto been purchasing power from the Middlecreek company.

LOS ANGELES, CAL.—The Pacific Electric Company has let the contract for the extension of the Covina line from Covina to San Dimas to Robert Sherer and Company. The Ontario and San Antonio Heights' line from Pomona to Uplands, via Claremont has settled its right-of-way difficulties and construction is being rushed on this line, as well. This will mean that within a few weeks there will be only the seventeen-mile gap between San Dimas and Pomona to be connected up before the Pacific Electric will be in a position to run cars from Long Beach to Ontario.

SACRAMENTO, CAL.—The Northern Electric Company has commenced boring in the Sacramento River, preliminary to placing concrete piers for the new bridge. Work of ballasting the Northern Electric roadbed from Alamos, twenty miles north of here, to Sacramento, is in progress and will be finished before the wet weather sets in. A new depot has been finished on the line at Thermolito and work is in progress on a structure at Nicolaus. The construction of a new station at Live Oak will soon be commenced. The report of the Northern Electric to the State Board of Equalization shows the gross earnings of the railroad to have been $422,642 for the fiscal year.

FT. WAYNE, IND.—Levering Jones, president of the Ft. Wayne & Wabash Valley Traction Company announces that $200,000 will be expended by the company in building and equipping new shops and car barns in this city. Mr. Jones expects to receive and make public in a short time the report of Howard P. Page, an expert, who has been going over the books and plant of the municipal light plant to show how much the city has lost by selling current for commercial lighting and power at the present low price. Mr. Jones contends that inasmuch as his company has expended a million dollars in Ft. Wayne the commercial lighting ought to be given over to his company. S.

CHARLOTTE, NO. CAR.—The city council granted to Paul Chatham, on July 29, a franchise to operate a street railway in Charlotte. Charlotte already has a system of some twenty miles. Ostensibly the same is a franchise to build an electric line out to a large suburban tract of land owned by Chatham, but it is not believed that this is the full extent and purpose of the new franchise. The Southern Power Company is building an interurban line from Anderson to Greenville to be extended to Spartanburg, and eventually, it is stated, on to Charlotte and Greensboro, and perhaps to Durham, home of the Dukes who largely control the Southern Power Company.

SPRINGFIELD, ILL.—Certificate of incorporation has been filed in the office of Secretary of State Rose by the Sterling-Moline Traction Company, with its principal offices located at Sterling. The capital stock of the company is $100,000. The object is to construct a railroad from Sterling, in Whiteside County, through the counties of Lee and Bureau, to Princeton. The incorporators and first board of directors are: Joseph Wright, Rock Falls, Ill.; A. R. Lewis, Morrison, Ill.; C. D. Gallentine, Morrison, Ill.; C. D. Sturtevant, Erie, Ill.; J. W. Harpham, Sterling, Ill.; Wm. H. Shaw, Lyndon, Ill.; G. E. W. Burch, Galt, Ill; W. McNeil, Prophetstown, Ill.; George A. Allen, Sterling, Ill.; Wilbur E. Fuller, Morrison, Ill.; Augustus G. Van Petten, Sterling, Ill.; Allen R. Parmeter, Lyndon, Ill. Z.

SPRINGFIELD, ILL.—Certificates of incorporation were filed recently with Secretary of State Rose by the Valley Park, St. Louis & Eastern Railway Company, with its principal offices located at East St. Louis, Ill. The object is to construct a railroad from a point on the Mississippi River opposite to the City of St. Louis, Mo., to a point on the State line of Indiana, in the County of Iroquois, and passing through the counties of St. Clair, Madison, Bond, Jersey, Calhoun, Clinton, Washington, Jefferson, Marion, Fayette, Effingham, Moultrie, Douglas, Champaign, Ford, Monroe and Randolph. Capital stock, $100,000. Incorporators and first board of directors: Will O. Plass, St. Louis, Mo.; Ormond B. Plass, St. Louis, Mo.; Charles Neustadt, East St. Louis, Ill.; John H. Suess, East St. Louis, Ill.; Henry Schrader, Belleville, Ill. Z.

FREEPORT, ILL.—Stockholders of the Freeport Railway, Light and Power Company voted to consolidate with the Freeoprt Railway and Power Company, the latter being the holding company. The stockholders authorized the issuance of $1,200,000 capital stock of which $400,000 is preferred and $850,000 is common stock. The following directors were elected by the stockholders: C. E. Gregory, Chicago; H. H. Antrim, Fred Dorman, W. N. Cronkrite, T. H. Hollister, Charels Lines and A. J. Goddard. The directors elected the following officers: President, C. E. Gregory, Chicago; vice-president, A. J. Goddard; secretary, T. H. Hollister, and treasurer, Fred Dorman. As soon as the consolidation certificate is filed with the secretary of state, a $2,000,000 bond issue, at interest of five per cent payable in five years probably will be authorized. Enough of the bonds will be issued immediately to refund the existing bonds of the Freeport Railway, Light and Power Company and to purchase the Pecatonica River Power Company and Highland Park and provide $100,000 for the erection of a new power house and other improvements. Z.

TELEPHONE AND TELEGRAPH.

(Special Correspondence)

SULLIVAN, IND.—The city council has voted to install a new and modern electric fire-alarm system.

WILLOWS, CAL.—The Tehama County Telephone Company has been granted a franchise to install its service in the town of Tehama. A.

MENOMINEE, WIS.—The Tri-State Telephone and Telegraph Company has petitioned the council for a franchise to run its lines through the city.

SILER CITY, N. C.—The Bonleee Telephone Company has been chartered with a capital of $10,000, by J. Wade Siler, C. N. Bray and Walter D. Siler, all of Siler City. L.

YUMA, ARIZ.—The Consolidated Telephone, Telegraph and Electric Company has been granted a franchise to extend its telephone and telegraph lines in the county of Yuma. A.

GREER, S. C.—The Fairview Telephone Company is commissioned by the secretary of state, capital stock $2,000. Incorporators are W. D. Cox, C. Ballenger and I. P. Few. L.

WATERTOWN, S. D.—The Dakota Central Telephone Co. has plans completed for improvements, aggregating $20,000. About 640 miles of wire and 26,000 feet of cable will be strung.

PENDLETON, ORE.—The Butter Creek Telephone Line has been taken over by the Eastern Oregon Independent Telephone Company. A. B. Thomas will manage the new company. A.

SMITHVILLE, ILL.—Articles of incorporation have been filed with the county recorder at Peoria by the Smithville Telephone Company, a concern capitalized at $2,400 to conduct a telephone system. The incorporators are R. A. Stewart, Edgar Harper, Luther Couch and James M. Smith. Z.

HARTFORD, CONN.—The Bolton & Coventry Telephone Company has filed a certificate of incorporation. The concern has a capital stock of $2,000, and it will construct and operate a rural telephone line. The incorporators are John Cairnes, of Manchester, Myron W. Main, of Bolton, and Robert W. Pitkin, of Coventry.

PEKIN, ILL.—The Citizen's Telephone Company has elected the following directors: John Fitzgerald, James W. Barrett, Jacob Roelfs, V. P. Turner, E. R. Peyton, W. B. Cooney and H. G. Herget. The officers chosen are: President, James W. Barrett; secretary, treasurer, John Fitzgerald; manager, George H. Glass, and local manager, E. M. Seibert. Z.

SEYMOUR, IND.—The Farmington-Chestnut Ridge Telephone Company has incorporated. The capital stock is $3,000, divided into 600 shares of $30 each. The company proposes to construct, equip and operate a telephone system in Jackson County, Ind., with exchange in Farmington. Albert Ahlbrand, William Booth, B. F. McIntire, John F. Albering, George Nuss and A. A. Ruddick, directors. S.

SALINA, KAN.—The Independent Telephone Company recently began the construction of a toll line from Abilene to this city and by an agreement with the Bell Company the new company will enter Salina over the Bell lines, there being an ordinance compelling all new lines to be put under ground. The Postal Telegraph Company, it is said, has leased the Independent lines and will open an office here.

BOSWELL, IND.—The Boswell Telephone Company has filed articles of incorporation with the secretary of state. The capital stock is $20,000, divided into 400 shares of $50 each. The object of the company is to build, equip and operate a telephone system and exchange in Boswell and throughout Benton county. The directors are Ray Keys, Robert W. Edmonds, R. L. McDaniel and Wm. H. Cook. S.

WATERTOWN, N. Y.—An independent telephone line is being projected to run between this city and Gouverneur, Canton, Ogdensburg, Potsdam and Malone and other northern points. If the present plans are carried out it will be in operation by November 1. Rights of way between this city and Gouverneur, the southern end of the St. Lawrence County independent lines. have been secured, with the exception of a small portion of the way.

RENO, NEV.—J. F. Adams, for some time the Reno manager of the Pacific Telephone and Telegraph Company has resigned his position to take charge of the Nevada-California-Oregon Telephone and Telegraph Company in the position of general manager. Mr. Adams has been succeeded by E. H. Hefferman of Sacramento, Cal. The Nevada-California-Oregon Company has a line running from Reno, Nev., to Altruas, Cal., and is now extending to Lakeview, Cal.

SEYMOUR, IND.—The Jennings & Jackson County Rural Telephone Company has filed articles of incorporation with the secretary of state. The capital stock is $3,000. The company proposes to build, equip and operate a telephone system in the counties of Jackson and Jennings, in the state of Indiana. The principal office and exchange will be at Andrew Seibert, Seymour, R. F. D. No. 6. Michael Hunt, William Kessler, Jacob Noll, Clayton Downs, Fred Niehouse and Frank Fill, directors. S.

ARKVILLE, N. Y.—The Arkville Home Telephone Company, organized to operate in Ulster and Delaware counties, has been incorporated with the secretary of state. The company has a capital of $1,000 and will operate in Arkville, Fleischmanns, Griffin's Corners, Highmount, Pine Hill, Kelly's Corners, Halcottsville, Roxbury, Grand Gorge, Stanford, Margaretville, Dunraven, Arena, Union Grove, Shavertown, Downsville, East Branch. The directors are: H. Eugene Ganung, Ella Ganung, Scudder T. Wipple, Jerry A. Harrington, Calvin C. Cammer, of Arkville; Orson A. Swart and Andrew C. Fenton, of Margaretville.

ELECTRICAL SECURITIES.

A slackening off in business, with lower prices, marked the end of the past week, but the market is one of sound underlying conditions. Almost as soon as low prices were the rule, the report of the United States Steel Corporation was made public. It was a remarkable report, for it showed an increase of $2,500,000 in net earnings over the preceding quarter and approximately $10,000,000 increase over the corresponding quarter of 1909. In the trading of the week two phases stood out prominently. One was the immense buying by London, which for months past has shown remarkable ability to get American stocks at the lowest prices. Another was the odd lot and investment buying. This odd lot buying is no longer concentrated in a few houses as it was prior to 1907, but spreads over the district. The total amount of buying was immense and the volume of stocks taken away to be locked up very large.

After liberal charges for depreciation, the Nashville Railway and Light Company showed for the first six months of the present year a surplus after preferred dividends equivalent to two per cent on the $4,000,000 common stock, which offers some justification for the directors placing the junior shares on a three per cent annual basis. Gross earnings for the six months were $887,954, or about seven per cent better than last year, and net $371,365, or 9.5 per cent better than last year. A surplus equivalent to 3.49 per cent on the common was earned last year and two per cent was paid, being the first disbursement that the common stock had received. A director says that he expects the rate will be increased again next year. The two more quarterly payments in this year will be at the three per cent rate.

DIVIDENDS.

Boston Elevated, semiannual dividend of three per cent, payable August 15.

Marconi Wireless Telegraph, initial preferred dividend of seven per cent, payable August 1.

Metropolitan West Side Elevated Company; regular quarterly dividend of three-quarters of one per cent on the preferred stock, payable September 1 to stock of record August 10.

CLOSING BID PRICE FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

NEW YORK.

	August 1.	July 25.
Allis-Chalmers common	8	8½
Allis-Chalmers preferred	23½	28
Amalgamated Copper	61¼	59⅜
American Tel. & Cable	*80	*80
American Tel. & Tel.	130¾	131⅜
Brooklyn Rapid Transit	73⅝	73⅝
General Electric	139	139
Interborough-Metropolitan common	16⅜	16⅞
Interborough-Metropolitan preferred	44	48¼
Kings County Electric	*124	124
Mackay Companies (Postal Telegraph and Cables) common	81	87½
Mackay Companies (Postal Telegraph and Cables) preferred	71	73½
Manhattan Elevated	127	128½
Metropolitan Street Railway	*18	*18
New York & New Jersey Telephone	*103	103
U. S. Steel common	66¾	65⅝
U. S. Steel preferred	115	114⅛
Western Union	60	60
Westinghouse common	54	57½
Westinghouse preferred	*125	125

BOSTON.

American Tel. & Tel.	130¾	131¾
Edison Elec. Illuminating	*255	255
General Electric	*139	139
Massachusetts Electric common	14¾	14¼
Massachusetts Electric preferred	79	78
New England Telephone	*132	132
Western Tel. & Tel. common	*15	15
Western Tel. & Tel. preferred	*85	85

PHILADELPHIA.

American Railways	42	42
Electric Company of America	11¼	11⅝
Electric Storage Battery common	47¼	49
Electric Storage Battery preferred	*49	49
Philadelphia Electric	14⅝	14⅝
Philadelphia Rapid Transit	17⅝	17⅝
Philadelphia Traction	82¾	84½
Union Traction	43	43¾

CHICAGO.

Chicago Railways, Series 1	70	65
Chicago Railways, Series 2	15	15
Chicago Subway	*2¼	2¼
Chicago Telephone	116	117
Commonwealth Edison	110	116
Metropolitan Elevated common	18½	80
Metropolitan Elevated preferred	59	61
National Carbon common	114	116
National Carbon preferred	115	118

*Last price quoted.

PERSONAL MENTION.

CORNELIUS AMBRUSTER, formerly with the Chicago branch of the Electric Storage Battery Company, will hereafter be located at the factory in Philadelphia.

ADDISON B. BURK, JR., engineer in charge of the Cleveland Exide Depot, has been spending his vacation in the neighborhood of Chicago, visiting his old haunts.

JOHN W. DORSEY, formerly of the Clarkson School of Technology, has been appointed lecturer on electrical engineering in the University of Manitoba, at Winnipeg.

L. KEMPER has disposed of his business interests in Chicago and resumed the position of manager of the Albert Lea Light and Power Company, of Albert Lea, Minn. Mr. Kemper resigned this position some time ago to engage in business in Chicago.

M. S. SPERRY, in charge of the pole department of, and correspondent for, the Kellogg Switchboard and Supply Company, left the company August 1. Mr. Sperry has accepted a position with a well-known Milwaukee lumber firm, McGillis & Gibbs Company, Wells Building.

M. S. SLOAN who has for several years been head of the business department of the Birmingham Railway, Light and Power Company, was recently promoted to the position of assistant to the president of that company. Mr. Sloan is a graduate of the Alabama Polytechnic Institute.

LUTHER DEAN acted as master of ceremonies during the recent trip of inspection which the Albany Society of Civil Engineers made over the Albany Southern Railroad at the invitation of J. G. White & Company, who have almost completed the double-tracking of this road, which operates with the third-rail system.

JAMES JEFFREY, for many years connected with the William Mueller Company is now associated with the Duluth Log Company of Duluth, Minn., as auditor and assistant general manager. Mr. Jeffrey's wide experience in the pole business makes him a valuable addition to the already large and efficient staff of the Duluth Company.

L. G. MARTIN, engineer of the Okonite Company of New York, writes an interesting and instructive article on "What Comprises Good Insulation" in the *Railway Master Mechanic* of July, 1910, which concludes as follows: "Having outlined a means of determining high-grade rubber insulation it only remains to add that the most important thing of all, after having drawn up rigid specifications on the lines suggested, is to see that the tests are all made and complied with in every particular."

B. W. KEELY of Atlanta has been appointed manager of the Southern Bell Telephone and Telegraph Company's office at Pensacola, Fla. The appointment was effective August 1. Mr. Keely is one of the best known young men of Atlanta, and as he has only been with the Southern Bell Company two years, his promotion indicates his ability. Mr. Keely succeeds A. C. Hobson, who has been appointed district commercial manager at Columbia, S. C., succeeding S. C. Lucas, who has been promoted to the position of special agent to the superintendent at Charlotte, N. C.

MME. CURIE was awarded the Albert Medal of the Royal Society of Arts, which is conferred annually for "distinguished merit in promoting arts, manufactures or commerce." This medal was granted this year for the discovery of radium which was made by Mme. Curie, working jointly with her husband, Prof. Curie. Mme. Curie is the second woman to receive the society's Albert medal, it having been conferred, in 1887, on Queen Victoria "in commemoration of the progress of arts, manufacturers, and commerce throughout the Empire during the fifty years of her reign."

OBITUARY.

ROBERT L. ANTHONY, one of the oldest transit inspectors in the service of the Public Service Cimmission, died recently at his home in Brooklyn.

JAMES BIGLER, for several years president of the Hudson River Telephone Company, and a pioneer in telephone work, died at Newburgh, N. Y., July 16, at the advanced age of ninety-two years.

WILLIAM VAN VLECK LIDGERWOOD, died July 2 at his home in London, England. Mr. Lidgerwood was at the time of his death the London representative for the Lidgerwood Manufacturing Company, of Newark, N. J.

OSWALD F. JORDAN, president of Oswald F. Jordan & Company, railway equipment manufacturers, died at his home in Chicago, August 1. Mr. Jordan has been intimately connected with railway work for a long time, and previous to coming to Chicago was for fourteen years division superintendent of the Michigan Central Railroad. He is survived by his widow and three daughters.

EDWARD A. BESSEY, assistant professor of electrical engineering at the State Agricultural College, Fort Collins, Colo., died from a severe pulmonary hemorrhage on July 12. Professor Bessey came to the college in 1909 as instructor, and had just been promoted. He was previously with the General Electric Company at Pittsfield, Mass., for ten years. He was an associate of the American Institute of Electrical Engineers and a member of Phi Betta Kappa and Sigma Xi honorary college societies.

LEGAL NOTES.

WHEN MESSAGES ARE ACCEPTED BY TELEPHONE OR ORALLY.—The court of civil appeals of Texas says that the law seems to be well settled that a telegraph company which accepts a message by telephone cannot claim that the conditions in its printed forms are applicable, where it is accustomed to receive such messages. It is also held in such cases that the agent of the company is not the agent of the sender. Obviously the same rule applies to receiving and transmitting a telegram delivered orally that obtains for one delivered by telephone and accepted by the company.—Gore vs. Western Union Telegraph Company, 124 S. W. 977.

GENERAL RULE AS TO INSPECTION OF POLES, ETC.—The general use of electricity for various purposes has brought before the courts many cases involving the question of the duty or not of inspecting poles and their appurtenances. The general rule to be deduced from cases showing the trend of the decisions may be thus stated: When the employer has no independent system of inspection of poles, cross-arms, steps, etc., and the lineman has no reason to believe that such inspection is made, he has no right to rely on the employer for such inspection but must make such tests himself as may be necessary to ascertain whether it is safe to go upon them, and cannot hold the employer responsible for injuries received by him by such poles, cross-arms, or steps giving way, unless there was some defect in them when they were originally placed in position, or the employer had some knowledge of the defect, which was not communicated to the lineman.—Court of appeals of Maryland in Consolidated Gas, Electric Light and Power Company vs. Chambers, 75 Atl. 241.

IMPROPER BRACING OF POLE IN PARKWAY.—A telephone company which, under permission from the city, maintained a telephone line along a parkway between the sidewalk and curbing, braced one of its poles with a guy wire composed of several wires twisted together and run from the top of the pole at an angle of about forty-five degrees to an anchor buried in the parkway. The Kansas City court of appeals says that in a proper case the jury would be justified in finding that an ordinarily careful and prudent person would not have constructed a guy wire in a way to leave it so inconspicuous. The company was bound to anticipate that the parkway might be used by persons crossing over at night, and had no right to make a snare or trap of its guy wires. This was not a case where an unlawful obstruction had been placed in the highway, but was one where a lawful obstruction had been negligently constructed. The company had a right to brace the pole, and to appropriate as much of the highway as was necessary to the proper construction and maintenance of its line. Its wrong lay in the method of construction.—Bentley vs. Missouri and Kansas Telephone Company, 125 S. W. 533.

THIRTY CENTS ENOUGH FOR WRONGFUL REMOVAL OF TELEPHONE.—In a suit for damages for the alleged wrongful removal of a subscriber's telephone it was shown that he had been delinquent in the payment of bills. The same day that he paid the last one a collector, who was unaware of the payment, called and something was said by the irritated subscriber which was taken to be that he wanted the telephone removed. The collector then notified the office and the instrument was removed. On the decision of the court of appeals of Georgia considers that a judgment for thirty cents should be affirmed, as it could not be said that one for a larger amount was demanded by the evidence. At the same time, it suggests that the fact that the subscriber asked an explanation, and the fact that he was refused one, or any facts going to show that a satisfactory explanation of the removal of his telephone was not given, would be clearly admissible in evidence as illustrative of the intention with which the telephone was removed, and as circumstances going to show that it might have been removed for the purpose of humiliating or exasperating him, and thus aggravating the wrong which had been done him.—Jenkins vs. Southern Bell Telephone and Telegraph Company, 67 S. E. 124.

DISCOUNTS TO CITY, CHARITY AND CLERGYMEN.—In the case of a telephone company allowing a discount of twenty-five per cent from the regular schedule rates for local messages, to the city, upon service paid for by the city; to charitable institutions regularly incorporated as such, in connection with stations placed in such instiutions; and to clergymen regularly ordained, in connection with stations in their residences or studies, the first appellate division of the supreme court of New York says that it is difficult to imagine any ground upon which the consideration extended to the three particular classes enumerated can be held to be an unfair, unjust, or unreasonable discrimination against any one. If the corporation chooses to exercise benevolence by granting a reduction from its regular charge to those who are universally recognized as the proper recipients of consideration, that is a matter between the corporation and its stockholders, who are conferring the favor, and not a concern of a customer that contributes nothing to it. If the corporation chooses to recognize its obligation to the city by assisting in decreasing the expenses of government to the extent of a percentage of the charges for telephone service for official needs, it is doing that which proportionately reduces the burden upon all taxpayers, and this unusual recognition of a debt of gratitude should not be discouraged.—New York Telephone Company vs. Siegel-Cooper Company, 125 N. Y. S. 1033.

PROPOSALS.

LIGHTING SUPPLIES FOR ATLANTA PENITENTIARY.—The Department of Justice is calling for proposals until August 17 for supplies for the electric light service at the Atlanta Penitentiary and until August 19 for similar supplies for the penitentiary at Leavenworth, Kans.

POST OFFICE, YORK, PA.—The office of the Supervising Architect, Washington, D. C., will receive sealed bids until September 13, for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring), of the United States Post Office at York, Pa., in accordance with drawings and specifications, copies of which may be obtained from the custodian of site at York, Pa., or at the Supervising Architect's office.

POST OFFICE, ST. LOUIS, MO.—The office of the Supervising Architect, Washington, D. C., will receive sealed bids until August 26 for the installation of a steam heating and ventilating apparatus, etc., for the United States Post Office building at St. Louis, Mo., in accordance with the drawings and specifications therefor, copies of which may be had at this office or at the office of the superintendent of construction at St. Louis, Mo.

POST OFFICE, OLEAN, N. Y.—The office of the Supervising Architect, Washington, D. C., will receive sealed bids until August 31, for the construction complete (including plumbing, gas piping, heating apparatus, electric conduits and wiring), of the United States Post Office at Olean, N. Y., in accordance with drawings and specification, copies of which may be obtained from the custodian of site at Olean, N. Y., or at the Supervising Architect's office.

POST OFFICE, SAN MARCOS, TEX.—The office of the Supervising Architect, Washington, D. C., will receive sealed bids until September 6, for the construction, complete, (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the United States Post Office at San Marcos, Tex., in accordance with drawings and specifications, copies of which may be obtained from the custodian of site at San Marcos, Tex., or at the Supervising Architect's office.

POST OFFICE AND CUSTOM HOUSE, PORT ARTHUR, TEX.—The office of the Supervising Architect, Washington, D. C., will receive sealed bids until September 9, 1910, for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the United States Post Office and Custom House at Port Arthur, Tex., in accordance with drawings, specifications, copies of which may be obtained from the custodian of site at Port Arthur, Tex., or at the Supervising Architect's office.

POST OFFICE, PLATTSMOUTH, NEB.—The office of the Supervising Architect, Washington, D. C., will receive sealed bids until September 19, for the construction complete (including plumbing, gas piping, heating apparatus, and electric conduits and wiring), of the United States Post Office at Plattsmouth, Neb., in accordance with drawings and specifications, copies of which may be obtained from the custodian of site at Plattsmouth, Neb., or at the Supervising Architect's office.

INDUSTRIAL ITEMS.

THE PUGET TIMBER COMPANY, of 324-5 Bailey Building, Seattle, Wash., announces that it is prepared to make prompt shipments of western-cedar poles to all parts of the country. The company has a large stock of assorted sized poles and makes a specialty of long lengths.

THE CROUSE-HINDS COMPANY, Syracuse, N. Y., has distributed No. 3 of its condulet talk. The booklet is well illustrated and contains a complete list of conduit outlet boxes for the mounting of snap switches. Two illustrations show the appearance of conduits installed over fruit stands and bootblacks' chairs.

THE LORD MANUFACTURING COMPANY, New York, N. Y., recently mailed Bulletin "H" on the Heany Luminator flaming-arc lamp. This lamp will burn on an average of thirty-five hours per trim. Many valuable suggestions are given in the folder, which also contains several diagrams. A copy of this publication will be sent to anyone desiring it.

THE RIDGWAY DYNAMO AND ENGINE COMPANY announces that recent sales of its four-valve engines indicate that these engines are proving all that is claimed for them. Many of the company's customers have placed their orders only after an inspection of the manufacturing facilities and actual tests. A large number of sales have been made recently.

THE AMERICAN ELECTRIC LAMP COMPANY, Philadelphia, Pa., announces that it has recently opened an office and warehouse at No. 184 Franklin Street, Boston, Mass. The New England warehouse is to be in charge of A. E. Payne, who is in charge of that territory. The company will carry, in Boston, a large stock of Mazda, tantalum, Gem and carbon-filament lamps, also a complete line of miniature lamps with carbon, tungsten and tantalum filaments.

THE BRYANT ELECTRIC COMPANY, Bridgeport, Conn., shows on a recent wall chart, illustrations of its line of interchangeable sockets. Any of the ten "New Wrinkle" sockets shown will fit any of the eighteen caps and bases which are illustrated on the chart. Through various changes it is possible to obtain one-hundred-and-eighty combinations from these twenty-eight pieces. Catalogue numbers, standard-package quantities and list prices are given in tabulated form.

THE HOLOPHANE COMPANY, Newark, O., publishes in the July number of *Holophane Illumination* an item regarding the installation of Holophane reflectors in seventeen Brooklyn Public Libraries. An illustration of one of these libraries is shown. Anther interesting installation which is described and illustrated in that number is the band stand of the Kurhaus of Weisbaden, Germany. The light in this band stand is so well diffused that although the audience looks directly at the lamps there is no annoyance from glare.

THE TRUMBULL ELECTRIC MANUFACTURING COMPANY, Plainville, Conn., recently mailed its August number of *Trumbull Cheer*. In addition to the Trumbull specialties listed, the booklet contains a number of valuable suggestions to salesmen. Notices have been sent with this issue announcing that the factory will be closed for one week, August 14 to 20, for general repairs and the annual vacation. All regular business will be attended to and the orders executed for material which the company carries in stock. The week's closing of the factory will delay only special orders.

THE SANITARY PUMP COMPANY, DAYTON, O., recently mailed Bulletin No. 12, dealing with its "Sanitary" duplex double-acting power pumps and pneumatic water systems. The specifications of the pumps are given together with price lists, dimensions, capacities, weights, etc. The bulletin is well illustrated throughout. A flyer sent with this bulletin illustrates and describes the "Sanitary" automatic electric water lift for bath room water supply. The electric house pump illustrated uses only a one-eighth-horsepower motor and has a capacity of 120 gallons per hour.

DOSSERT & COMPANY, INC., New York, N. Y., sole manufacturer of the Dossert solderless electrical connectors or cable joints for standard or solid wire, have opened a Chicago office for the western district, at 617-31 West Jackson Boulevard. G. W. Armstrong, the well-known flaming arc lamp man, will be the manager of this office and will have entire charge of the Dossert interests in this section. The greatly increased use of mechanical wire connectors in many classes of wiring has led to a steady development and improvement in connectors. The Dossert Company devotes all its energies to this one line, and as a consequence it is able to offer connectors for every possible demand. Among its customers in the West are the largest consumers in the country, and the western office has been established so that users in this section may be served to better advantage than formerly. The Chicago office will carry a complete line of the company's products.

THE GENERAL ELECTRIC COMPANY, Schenectady, N. Y., has recently issued a number of bulletins which have been mailed to the trade. One of these, Bulletin No. 4751, is devoted to various types of the Company's induction motor. The bulletin contains illustrations and descriptions of the design and construction of the skeleton frame motor of different sizes, and describes a vertical motor which can be furnished when this form is advantageous. Large Mazda lamps are described in Bulletin No. 4753. In this bulletin there are a number of illustrations of these 400- and 500-watt lamps, and also several designs of monoflux units. These lamps are suitable for large stores, armories, factories, etc., and are economical substitutes for other building units of high candle-power and clusters of small lamps of low candle-power. They have the simplicity, reliability and convenience of the ordinary incandescent lamp of low candle-power. Bulletin No. 4756, gives a graphic description of the ventilation of horizontal steam-turbine alternators, which will be instructive as well as interesting to those connected in any way with the operation of these machines. Another publication, Bulletin No. 4742, contains a description and illustrations in considerable detail of an intensified arc lamp which the company has designed for general illuminating purposes, and which is simple, mechanically, and reliable in operation. The principal characteristics of the lamp, are its high efficiency and the daylight quality of its light. The publication contains a color chart showing the illuminating values of various forms of lighting as compared with daylight. This chart compares the incandescent, Welsbach, Nernst and the arc, with daylight. Bulletin No. 3968 illustrates and describes various appliances designed especially for hotels and restaurant use, for example, broilers, roasting and baking ovens, toasters, plate warmers, stock kettles, automatic egg boilers, etc.

DATES AHEAD.

Michigan Electrical Association. Annual convention, Port Huron, Mich., August 16, 17 and 18.

Indiana Electric Light Association. Second annual meeting, Indianapolis, Ind., August 17 and 18.

League of American Municipalities. Annual convention, St. Paul, Minn., August 23-26.

Pacific Coast Electrical Exposition. San Francisco, Cal., August 20 to August 27, 1910.

Northwest Electric Light and Power Association. Annual convention on board the Steamship *Queen*, leaving Seattle, Wash., August 26 and returning August 29.

Pacific Coast Electric Vehicle Association. Next meeting, San Francisco, week of August 22.

Telephone and Telegraph Engineers' Second International Conference, Paris, France, September 4-11.

International Association of Municipal Electricians. Annual convention, Rochester, N. Y., September 6, 7, 8 and 9.

Old Time Telegraphers' and Historical Association and the Society of the United States Military Telegraph Corps. Twenty-ninth annual reunion, Chicago, Ill., September 8-10.

Pennsylvania Electric Association Convention, Glen Summit Springs, Pa., September 14-16.

New England Section, National Electric Light Association. Fall convention, Pleasant Point, New London, Conn., September 13 and 14.

Colorado Electric Light, Power and Railway Association. Next convention, Glenwood Springs, Col., September 21, 22 and 23.

Kansas Gas, Water, Electric Light and Street Railway Association. Annual meeting, Kansas City, Kan., September 27-28.

Denver Electric Show. Annual Exposition, Denver, Col., October 8-15.

American Street and Interurban Railway Association. Annual convention, Atlantic City, N. J., October 10-14.

American Society of Municipal Improvements. Annual convention, Erie, Pa., October 11-14.

Railway Signal Association. Annual meeting, Richmond, Va., October 11.

American Electrochemical Society, Eighteenth General Meeting, Chicago, Ill., October 13-15.

American Association of Electric Motor Manufacturers. Semi-annual meeting, Chicago, November 14, 15, 16.

Alabama Light and Traction Association. Next meeting, Anniston, Ala., November 21, 22, 23.

RECORD OF ELECTRICAL PATENTS.

Issued (United States Patent Office) July 26, 1910.

965,166. ELECTRIC FRICTION-CLUTCH. Leonard Huntress Dyer, Greenwich, Conn., assignor of one-fourth to Frank L. Dyer, Montclair, N. J. Filed Sept. 22, 1897. Renewed Dec. 8, 1909. An improved electric friction clutch comprises a fixed trough-shaped magnetic member, having an energized coil therein, and provided with two tapering pole pieces or rims, and a loose co-operating armature member having pockets, and an overhanging flange.

965,168. TRANSFORMER. Melville Eastham, Boston, Mass., assignor to Clapp-Eastham Company, Boston, Mass. Filed Sept. 3, 1909. A resonant circuit comprises the secondary of a closed-core transformer characterized by large magnetic leakage; a condenser is in circuit with this secondary; and the secondary has an inductive reactance approximately equal to the capacity reactance of the condenser for the alternation-frequency of the supply current.

965,175. SYSTEM OF MOTOR CONTROL. Ernest L. Gale, Sr., Yonkers, N. Y., assignor to Otis Elevator Company, Jersey City, N. J. Filed Oct. 9, 1907. There are means for controlling the starting resistance of the motor to effect an acceleration of the latter with normal load, and other means permitting the operation of the first means for overload.

965,185. TELEGRAPH AND OTHER POLE. John F. Hickman, Tampa, Fla. Filed Aug. 17, 1909. A built-up pole.

965,187. JUNCTION-BOX, RECEPTACLE, AND PLUG FOR ELECTRICAL CONNECTIONS. William A. Hopkins, Decatur, Ill., assignor to Ward Equipment Company, New York, N. Y. Filed Nov. 28, 1908. A terminal plug receptacle has an insulating block provided with recesses and with electrode sockets of different sizes, and a two-part supporting casing therefor having inwardly projecting portions fitting the recesses in order firmly to secure the block to the casing.

965,206. INCANDESCENT-LAMP SOCKET. Norman Marshall, Newton, Mass., assignor to Arrow Electric Company, Hartford, Conn. Filed Oct. 19, 1908. A key socket is provided with means for clamping the socket against a shoulder on a fixture with the key in any predetermined position with relation to the fixture.

965,207. ELECTRIC-CABLE LIGHTNING-ROD. Louis L. Mast, West Milton, Ohio. Filed Nov. 12, 1909. An electric cable for high-tension currents consists of a multiplicity of straight wires assembled in parallel relation, and a series of bands surrounding the wires, each of the bands having a laterally extended annular rim adapted to lie on the outside of the assembled wires.

965,234. ELECTRIC SWITCH. William M. Scott, Philadelphia, Pa., assignor to The Cutter Electrical and Manufacturing Company. Filed Oct. 9, 1909. A pivoted arm carries the main movable contact; a loosely pivoted arm carries a shunt contact; an operating member is provided for operating the main movable contact; and means on the operating member shift the shunt contact arm upon its pivot.

965,257. ANTISEPTIC MOUTHPIECE-COVER. William H. Waldron, San Francisco, Cal., and Louis R. Krumm, Columbus, Ohio. Filed Sept. 7, 1909. An antiseptic cover for telephone-transmitter mouthpieces.

965,274. ELECTRIC PRESSURE-RATIO INDICATOR. Asa White Kenney Billings, Habana, Cuba. Filed May 20, 1909. In combination with a device in which differences of pressure exist in different portions thereof, are the following apparatus: an electrically operated indicating instrument; a plurality of devices, each including a resistance wire partially immersed in a conducting fluid movable lengthwise of the wire by the variations in pressure acting thereon, interposed between first-mentioned device and the instrument adapted to change the potential of the current to the instrument by the change of pressures in two portions of the device.

965,275. WALL OR SWITCH BOX. Frederick S. Birtwhistle, Troy, N. H. Filed Apr. 27, 1909. A wall or switch box has guides movable in relation to the box, attaching lugs carried by and adjustable in relation to the guides, and means for securing the guides in different adjusted positions.

965,280. MOTOR-CONTROLLER. Herbert W. Cheney, Milwaukee, Wis., assignor to Allis-Chalmers Company. Filed Oct. 25, 1909. A gear and a cam wheel are mechanically connected to the drum, and a spring which acts at times through the cam wheel and at times through the gear, biases the drum backward when in a starting position and forward when in running position.

965,296. LAMP-CLUSTER. Gustav A. Harper, Chicago, Ill., assignor to Vincent Harter, Chicago, Ill. A cluster body is provided with means for removably holding a plurality of electric lamps, means for holding the lamps against withdrawal from the cluster body, and a lock for securing the holding-means for the lamps in operative position.

965,299. RHEOSTAT. Harry Hertzberg and Maurice J. Wohl, New York, N. Y., assignors to Economy Electric Company, Brooklyn, N. Y. Filed May 14, 1907. A rheostat comprises a plurality of separable metallic masses one of which is provided with external wedge-receiving members, an interposed resistance, and wedges co-operating with the wedge-receiving members and acting to clamp the separable masses into close mechanical engagement with resistance between them.

965,332. ELECTRIC WATER-HEATER. Frank A. Robinson, Albany, N. Y., assignor to William G. Van Loon, Albany, N. Y. Filed Oct. 27, 1908. An electric water-heater comprises a plurality of independent water-conducting pipes, a water upflow pipe communicating with a water supply, means for coupling the inlet ends of the conducting pipes to the upflow pipe, a water receiving chamber, means for coupling the outer ends of the conducting pipes to the water receiving chamber, an electric switch provided with a pair of terminals, electric heating conductors connected to one terminal, extending through respectively the upflow pipe, the water-conducting pipes and the chamber, and connected to the other terminal of the switch, a discharge pipe communicating with the water-receiving chamber, and means for closing the switch, and means for opening the discharge pipe.

965,333. ELECTRIC WATER HEATER. Frank A. Robinson, Albany, N. Y., assignor to William G. Van Loon, Albany, N. Y. Filed June 7, 1909. Similar to the preceding.

965,368. SUBMARINE-CABLE TELEGRAPHY. Sidney George Brown, London, England. Filed Sept. 10, 1907. A system for receiving signals from a cable in cable code comprises a relay, a series blocking condenser, a resistance shunting such condenser, a magnetic shunt across the relay, a resistance in series with such shunt and a reaction circuit which acts differently upon the three classes of signals, namely, reversals, consecutive signals of the same sign, and single signals whereby it is possible to utilize the discharge current from the cable and at the same time secure increased definition in the signals.

965,380. SPARK-PLUG. Robert E. Estes and John P. Inman, Midland, Tex. Filed Dec. 22, 1909. A spark plug includes a plug base, an insulating core, an electrode pin extending entirely through the core and projecting beyond its inner end, separate and independent means for adjusting the core with relation to the plug base and for adjusting the electrode pin longitudinally through the core, and means for holding the core and pin locked in their adjusted positions.

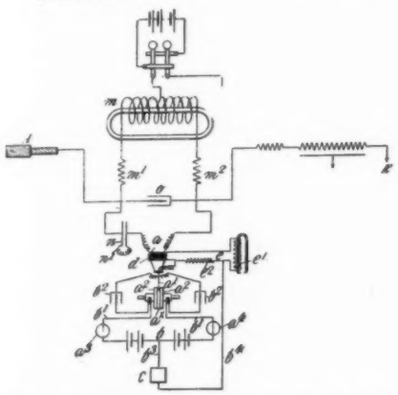
965,393. ELECTROCHEMICAL APPARATUS AND PROCESS. Einar Honoratus Meyer and Job Morten August Stillesen, Niagara Falls, Ontario, Canada. Filed Mar. 20, 1908. The process of making calcium carbide comprises collecting the gas evolved upon subjecting a mixture of carbon and lime to the action of an electric arc, burning the gas together with air in a mixture of coal and limestone to reduce the same to a mixture of carbon and lime, collecting the reduced mixture of carbon and lime as a mass in a separate inclosure, tapping from the

inclosure without cooling a desired quantity, and subjecting the same to the action of an electric arc.

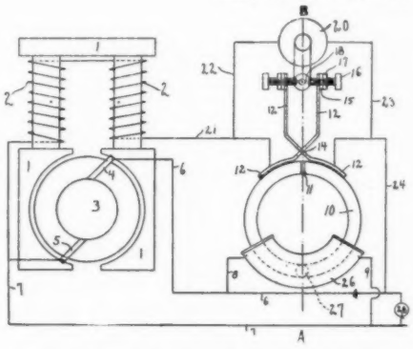
965,396. AUTOMATIC POTENTIAL-REGULATOR FOR DYNAMOS. John J. Mueller, Jr., Peru, Ill. Filed May 21, 1909. An automatic potential regulator for dynamos comprises an electromagnet connected across the main current lines, a core in the electromagnet, a resistance in the field circuit, contact points on the core of the magnet and insulated therefrom, co-operating with the electromagnet for opening and closing a shunt around the resistance. The resistance comprises an electromagent connected around the contact points, and pole-pieces are provided on the electromagnet adjacent to the contact points.

965,417. TELEGRAPH INSTRUMENT. Frank G. Slemmer, Goldsboro, Md. Filed May 12, 1909. The apparatus comprises a line circuit including a telegraph key, a circuit closer on and actuated by but insulated from the key, a local circuit embracing a circuit-closer-actuating mechanism and the circuit closer on the key, a circuit closer in shunt with the key on the line wire, the last-mentioned circuit-closer being actuated by the circuit-closing-actuating mechanism in the local circuit when the key is open.

965,442. MULTIPLE DROP-HOIST SYSTEM OF CIRCUITS. Andrew M. Coyle, New York, N. Y., assignor to Otis Elevator Company, Jersey City, N. J. Filed July 29, 1907. In multiple curtain-hoisting apparatus, the combination with an electric motor, are starting and stopping apparatus therefor, speed-controlling mechanism, a series of electromagnetic pushbutton switches, a corresponding series of devices to be controlled by switches, and means for retaining selected switches in closed position.



965,368.—SUBMARINE-CABLE TELEGRAPHY.



965,396.—AUTOMATIC POTENTIAL-REGULATOR FOR DYNAMOS.

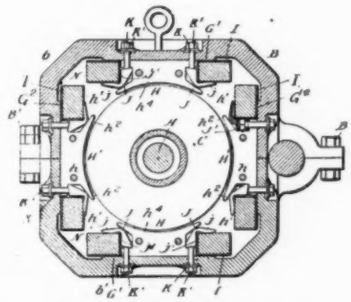
depression or seat to which the terminals, switches, fuses and similar parts are adapted to be secured.

965,534. TIME CIRCUIT-CONTROLLING APPARATUS. August P. Nelson, Chicago, Ill., assignor to Albert and J. M. Anderson Manufacturing Company, Boston, Mass. Filed Oct. 3, 1908. The apparatus comprises a circuit controller provided with a movable member, a time mechanism, a tripping cam actuated by the time mechanism and controlling the operation of the movable member, and means actuated by the time mechanism for automatically varying the time of action of the tripping cam to cause the movable member to be operated at a different time than that at which it is normally operated and for permitting such operation after a predetermined interval of time and while said means is in its operative position without disturbing the condition of the selective mechanism for operating the motor mechanism at other predetermined intervals of time.

965,543. ELECTRIC MOTOR. Frank L. Sessions, Columbus, Ohio, assignor to The Jeffrey Manufacturing Company. Filed Aug. 23, 1906. The field frame is divided into separable sections; a unitary pole piece extends across the line of separation of the frame sections; and independent means secure the polepiece to each of the frame sections.

965,549. CIRCUIT-BREAKER. John Young, Toledo, Ohio. Filed Nov. 11, 1908. A circuit breaker comprises a pair of superposed conducting arms, an oil chamber carried by the upper arm, a piston chamber carried by the lower arm, a piston sliding in the piston chamber, a conduit connecting the oil chamber and the piston chamber, a conducting fluid adapted to be forced into contact with the oil chamber and with the lower arm, and means to operate the piston to cause the conducting fluid to withdraw from the oil chamber.

965,569. DAMPER-REGULATING APPARATUS. Joseph B. Crandon, North Walpole, N. H., assignor to Crandon Manufacturing Company, Bellows Falls, Vt. Filed Sept. 16, 1908. Is controlled by an electric thermostatic device.



965,543.—ELECTRIC MOTOR.

965,449. ELECTRICALLY-HEATED APPARATUS. Horace B. Gale, Natick, Mass., assignor to Simplex Electric Heating Company, Boston, Mass. Filed Feb. 28, 1910. An electrically heated apparatus comprises a vessel for holding the substance to be heated, a separate heat-conveying part having electric heating means secured directly thereto, the heat-conveying part having a cavity in its upper side approximately fitting the lower part of the vessel, and adapted to retain a fusible substance by gravity, and a fusible metal securing the separate heat-conveying part directly to the vessel.

965,453. APPARATUS FOR MEASURING TELEPHONE SERVICE. Charles W. Greenslitt, Cleveland, Ohio, assignor of one-third to A. C. Morse and one-third to C. F. Saenger, Cleveland, Ohio. Filed Aug. 26, 1908. The system described includes, in combination with a calling subscriber's set, a receiving switch-board set comprising a complete cord circuit, and means connected therewith, whereby the time consumed by the calling subscriber is accurately spaced, and means whereby when the time is so spaced the calling subscriber is automatically shut off from communication with the called party.

965,456. CHARGING-SWITCH. William S. Henry, Rochester, N. Y., assignor to General Railway Signal Company, Gates, N. Y. Filed June 16, 1909. A storage-battery signal apparatus.

965,484. MAGNETO-GENERATOR. La Verne W. Noyes, Chicago, Ill. Filed Jan. 27, 1910. A magneto generator includes a compound permanent magnet formed of laminas spaced apart near a polar end and having a pole-piece terminating in spaced-apart laminas that are interleaved with the aforesaid laminas, and a structure holding the pole-piece, and outside of which the portion of the permanent magnet between its polar ends is located.

965,514. SWITCH AND FUSE SUPPORTING BASE. William J. Gibbons, Philadelphia, Pa. Filed Dec. 30, 1909. A support for the terminals, switches, fuses, and similar parts of an electric circuit consists of a main base provided with a depression or seat formed therein and insulating material mounted in the

965,585. SPARKING PLUG FOR EXPLOSIVE-ENGINES. Cyrus F. Jones, Oregon, Ill. Filed Nov. 4, 1908. A simple two-part spark plug.

965,609. ELECTRIC PUMP-GOVERNOR. Charles W. Townsend, St. Louis, Mo., assignor to The Westinghouse Air Brake Company, Pittsburg, Pa. Filed June 18, 1906. An electric pump governor comprises a cylinder, piston, and rod, an adjustable spring surrounding the rod, a laterally flexible retarding spring having a hump portion with inclined resistance surfaces, and a V-shaped projection carried by the piston rod for engaging these surfaces.

965,639. ELECTRICALLY-OPERATED SWITCH. John A. Lundeen, Edgewood Park, Pa. Filed June 30, 1909. Is provided with certain adjusting features.

965,649. STARTER FOR ELECTRIC MOTORS. William C. O'Brien and George H. Whittingham, Baltimore, Md., assignors to Monitor Manufacturing Company of Baltimore City. Filed April 9, 1907. An automatic starter.

965,670. MEANS FOR STOPPING ELECTRIC MOTORS. George H. Whittingham, Baltimore, Md., assignor to Monitor Manufacturing Company of Baltimore City. Filed Oct. 2, 1908. Switch for shunt-wound motors.

965,671. REVERSING-SWITCH. George H. Whittingham, Baltimore, Md., assignor to Monitor Manufacturing Company of Baltimore City. Filed Nov. 2, 1908. Reversing switch for shunt-wound motors.

965,672. APPARATUS FOR CONTROLLING ELECTRIC MOTORS. George H. Whittingham, Baltimore, Md., assignor to Monitor Manufacturing Company of Baltimore City. Filed June 7, 1909. Electromagnetically operated switch.

965,673. CONTROLLER FOR ELECTRIC MOTORS. George H. Whittingham, Baltimore, Md., assignor to Monitor Manufactur-

ing Company of Baltimore City. Filed June 21, 1909. A motor-controlling mechanism comprises a switch member, adjustable at will, a regulating resistance governed thereby, an automatically movable member, a starting resistance governed jointly by the two members, one of the members being adapted to bridge successive portions of the starting resistance.

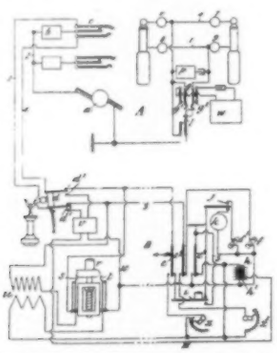
965,674. CONTROLLING MEANS FOR ELECTRIC MOTORS. George H. Whittingham, Baltimore, Md., assignor to Monitor Manufacturing Company of Baltimore City. Filed May 21, 1909. Controller for shunt-wound motor.

965,675. MOTOR-STARTER. George H. Whittingham, Baltimore, Md., assignor to Monitor Manufacturing Company of Baltimore City. Filed Aug. 4, 1908. Renewed Dec. 31, 1909. Automatic motor starter.

965,676. MOTOR-CONTROLLER. George H. Whittingham, Baltimore, Md., assignor to Monitor Manufacturing Company of Baltimore City. Filed Apr. 18, 1910. A controlling mechanism for electric motors comprises starting and regulating resistances for the armature circuit, and means for automatically maintaining the starting resistance in circuit and the regulating resistance out of circuit while the motor is starting, and for cutting out the starting resistance and including the regulating resistance after the motor has started.

965,684. CONNECTION AND SEAL FOR THE ENDS OF ELECTRIC CABLES. Fred N. Bierce and Edward T. Jones, Pittsburg, Pa., assignors of one-third to Charles W. Gerwig, Pittsburg, Pa. Filed Dec. 8, 1908. A junction box.

965,689. PRESSURE-GOVERNOR FOR ELECTRICALLY-OPERATED PUMPS. Francis L. Clark, Pittsburg, Pa., assignor to Standard Traction Brake Company. Filed Feb. 24, 1902. Pressure governor for electric air-pumps.



965,748.—COMBINED TELEPHONE AND TELAUTOGRAPH EXCHANGE SYSTEM.

965,710. ELECTRIC-LIGHT FIXTURE. Edwin E. Hayward, Waterbury Conn., assignor to The Plum & Atwood Mfg. Co., Waterbury, Conn. Filed Jan 3, 1910. In combination with a shade holder is a clamping band of spring metal adapted to extend around a lamp socket and a screw therefor and devices secured to the clamping band at substantially spaced intervals and extending to connection with the upper part of the shade holder, establishing a movable supporting relation between the band and shade holder, whereby the coincident axial relation of the parts may be effected.

965,723. INSULATOR. John Fred Malthaner, Chillicothe, Mo. Filed May 29, 1909. An insulator comprises ball-and-socket clamping members having oppositely disposed wire engaging surfaces, and means for drawing these members toward each other into clamping position and for securing the socket member to a suitable support.

965,734. PULL-SOCKET. Henry T. Paiste, Philadelphia, Pa. Filed Dec. 22, 1908. Acts on the ratchet-and-pawl principle.

965,740. TROLLEY DEVICE. William Peterman, Beaver Falls, Pa., assignor of one-half to William Wiesner, Beaver Falls, Pa. Filed Apr. 12, 1910. Has guards for the wire.

965,743. ELECTRIC-LAMP SOCKET. Frederick P. Poole, Bridgeport, Conn., assignor to The Bryant Electric Company, Bridgeport, Conn. An electric-lamp key-socket comprises an insulating body and screw shell and center contact, wire terminals, a key stem and a switch block mounted on the stem with lost motion, a spring to act on the switch block, a contact carried by the insulating body, and a spring-actuated plate to make connection with the contact, the switch block acting to close the circuit through the contact and to break it with a double break.

965,748. COMBINED TELEPHONE AND TELAUTOGRAPH EXCHANGE SYSTEM. Foster Ritchie, Acton, England. Filed Oct. 12, 1908. A combined telautograph and telephone exchange system comprises a local battery at each subscriber's station, circuit connections placing these local batteries normally in opposition, and means operative when sending a written message whereby the polarity of the battery of the sender is reversed.

965,754. RECORDING APPARATUS. Edwin M. Schantz, Cincinnati, Ohio, assignor to Universal Recorder Manufacturing Company. Filed Nov. 13, 1908. The recording apparatus includes means to give a record sheet a substantially continuous movement, type adapted to print at definite positions on the sheet, means to print from the type in accordance with certain conditions which it is desired to have indicated, and means operative at any time and at once to vary the character of a type in a particular position so as to further distinguish the indications on the record sheet.

965,793. ELECTRIC SELECTOR AND SIGNALING APPARATUS. William W. Alexander, Kansas City, Mo. Filed May 27, 1908. An electric signaling device comprises a rotary cog wheel, suitable axial supports therefor, a power-actuated propelling pawl adapted to propel the wheel measured distances in the circle of rotation, and vibrating time-controlling devices acting intermittently and alternately with the propelling pawl, to move the wheel in rotation.

965,798. MAGNETIC BRAKE-SHOE. Edgar Harry Cockshott, Leeds, and Alfred Walter Maley, West Bromwich, England. Filed June 16, 1910. A track brake electromagnet.

965,817. TROLLEY-STAND. William Horn, Detroit, Mich. Filed Dec. 13, 1909. Base mechanism for trolley poles.

965,833. AUTOMATIC PEG-COUNTER FOR TELEPHONE-EXCHANGES. Charles Howard North, Cleveland, Ohio, assignor to The North Electric Company, Cleveland, Ohio. Filed Aug. 11, 1909. A common-battery telephone-exchange system comprises line circuits and cord circuits with supervisory relays, in combination with an automatic step by step counting device and series connections therefrom to the several supervisory relays.

965,840. AUTOMATIC MOTOR-STARTER. George H. Whittingham and William C. O'Brien, Baltimore, Md., assignors to Monitor Manufacturing Company of Baltimore City. Original application filed Apr. 9, 1907. Divided and this application filed Oct. 2, 1908. An automatic starter for electric motors comprises a starting resistance in the armature circuit, a series of regulating solenoids having all of their operative windings of low resistance and arranged in the circuit, shunt circuits for cutting out windings of each solenoid, a section of starting resistance and a part of the coils of a succeeding solenoid, each of the shunt circuits comprising a solenoid core, a stationary contact below the core adapted to be engaged by the core and a flexible conductor connected to the core, in combination with means for normally supporting the cores above the contacts and an electromagnetic device for releasing the cores when current is turned on.

PATENTS THAT HAVE EXPIRED.

Following is a list of the electrical patents (issued by the United States Patent Office) that expired July 25, 1910:

501,911. CARBON-HOLDER FOR ELECTRIC-ARC LAMP. Sigmund Bergmann, New York, N. Y.

501,938. CARBON-HOLDER FOR ELECTRIC-ARC LAMPS. Frederic D. Hazelton, New York, N. Y.

501,960. COMMUTATOR-BRUSH. Henry G. Reist, Lynn, Mass.

501,961. MEANS FOR REGULATING ELECTRIC MOTORS. Charles H. Richardson, Philadelphia, Pa.

501,968. ELECTRIC-RAILWAY TROLLEY. Elmer A. Sperry, Chicago, Ill.

501,997. APPARATUS FOR THE ELECTROLYTIC EXTRACTION OF METALS. Stephen H. Emmens, London, England.

502,007. ILLUMINATED SIGN. Arthur L. McCormick, Port Huron, Mich.

502,020. ELECTRIC LOCOMOTIVE. Elmer A. Sperry, Chicago, Ill.

502,022. ELECTRIC MEASURING INSTRUMENT. Elihu Thomson, Swampscott, Mass.

502,040. RHEOSTAT. Charles A. Hussey, New York, N. Y.

502,077. ELECTRICAL MEASURING INSTRUMENT. Rudolph M. Hunter, Philadelphia, Pa.

502,091. SYSTEM OF TELEPHONIC INTERCOMMUNICATION. Frank R. Colvin, New York, N. Y.

502,098. ELECTRIC MOTOR FOR ROTARY DRILLING MACHINES. Robert M. Jones, Salt Lake City, Utah.

502,104 and 502,105. ELECTRIC-SWITCHING APPARATUS. Arthur R. Roe, Duluth, Minn.

502,157. ELECTRIC-CLOCK SYNCHRONIZER. Arthur G. Wiseman, Webster Groves, Mo.

502,166. ELECTRIC ARC LAMP. Patrick L. Barrett, Boston, Mass.

502,207. ELECTRIC SIGNAL FOR FIRE-ALARM SYSTEMS. Joseph Sachs, New York, N. Y.

502,215. ELECTRIC WINDING ATTACHMENT FOR CLOCKS. Arthur G. Wiseman, St. Louis, Mo.

502,216. CONDUIT SYSTEM FOR ELECTRIC RAILWAYS. Frank Wynne, London, England.

502,229. CONNECTOR FOR TRACK-CIRCUITS. Edward H. Goodman, Pittsburg, Pa.

502,243. ELECTRIC-RAILWAY TROLLEY. Charles J. Van Depoele, Lynn, Mass.

502,262. TELEPHONE-CABLE. William R. Patterson, Chicago, Ill.